

MUSE COMPTON TOOL
LIBRARY
JUL 1 1965
HARVARD
UNIVERSITY

PROCEEDINGS
OF THE
CALIFORNIA ACADEMY OF SCIENCES
FOURTH SERIES

Vol. XXXIII, No. 1, pp. 1-46; 26 figs.; 1 table

July 28, 1965

**THE BRACHYURAN DECAPOD CRUSTACEANS
OF CLIPPERTON ISLAND¹**

By

John S. Garth

*Allan Hancock Foundation, University of Southern California,
Los Angeles, California 90007*

TABLE OF CONTENTS

Introduction	2
Acknowledgment	3
Geographical Considerations	4
The Fauna as Known	5
List of Clipperton Island Brachyura	5
Account of Species	6
Subsection GYMNOPLEURA	6
Superfamily DROMIIDEA	6
Family DYNOMENIDAE	6
Subsection OXYSTOMATA	7
Family CALAPPIDAE	7
Subsection HAPALOCARCINIDEA	7
Family HAPALOCARCINIDAE	7
Subsection BRACHYGNATHA	11
Superfamily OXYRHYNCHA	11
Family MAJIDAE	11
Superfamily BRACHYRHYNCHA	12
Family PORTUNIDAE	12

¹ Allan Hancock Foundation Contribution No. 273.

TABLE OF CONTENTS—*Continued*

Family XANTHIDAE	16
Family GRAPSIDAE	25
Family GECARCINIDAE	35
Family OCYPODIDAE	37
Distribution	38
Endemism	38
Faunal Boundaries	39
Literature Cited	39

INTRODUCTION

Clipperton Island is situated in the eastern tropical Pacific Ocean at Lat. $10^{\circ} 18' N.$ and Long. $109^{\circ} 13' W.$ Because of its isolated position and lack of protected anchorage, it has been seldom visited by scientific expeditions, and even less frequently explored by carcinologists. Among the first to have collected crustaceans there was John T. Arundel, who visited the island in 1897 aboard the *Navarro*. The Hopkins-Stanford Expedition, with R. E. Snodgrass and Edmund Heller, visited Clipperton in 1898 aboard the *Julia E. Whalen*, collecting specimens of *Geograpsus lividus* from Clipperton Lagoon (Rathbun, 1902). A party from the Schooner *Academy* of the California Academy of Sciences in 1905 found the island to be infested with land crabs, *Gecarcinus planatus*, which made bird collecting difficult, since the crabs got to the birds before the collectors, and had them ruined in a few seconds (Slevin, 1931).

Many early accounts of Clipperton Island mention the abundance of land crabs, according to Sachet (1960), whose historical résumé has proved most useful in this connection. One of these, by Captain Detaille (letter to Lockhart of Le Havre), describes "les gros crabes rouges" seen by the crew of the *Amiral* in 1858 while on a phosphate-prospecting mission. Their first mention in the scientific literature was by Lenz (1901), who reported under the name *Gecarcoidea lalandei* specimens brought from Clipperton to Honolulu by vessels engaged in the guano trade. How these crabs found their way into the hands of Professor Schauinsland, on whose Pacific collections Lenz reported, is not known.

The first comprehensive collection of Clipperton Island decapods was made by Waldo L. Schmitt, who in 1938 spent a few hours ashore while en route to the Galápagos Islands aboard the U.S.S. *Houston*. While there he obtained 10 of the 34 species of brachyurans here reported, including the first *Thalamita* from the eastern Pacific. Following his brief visit no further crustacean collecting was done until 1954, when a party from the Acapulco Trench Expedition of the Scripps Institution of Oceanography was landed from the *Spencer F. Baird*. The nine species of brachyurans obtained were identified by the writer for inclusion in a paper by Hertlein and Emerson (1957). A similar landing from the *Spencer*

F. Baird was made in October, 1956, by Conrad Limbaugh. The 15 species of brachyurans obtained were identified by Fenner A. Chace, Jr., and are included in the present report. This was the situation when the International Geophysical Year (I.G.Y.) Clipperton Island Expedition, with Conrad Limbaugh as leader, landed from the *Spencer F. Baird* on August 7, 1958, remaining until September 25 of that year. The extensive collection of Brachyura then made includes all 12 species previously reported from the island, together with an additional 20 here reported for the first time. The Anomura and Macrura from this and the 1956 expedition were the subject of a separate report by Fenner A. Chace, Jr. (1962).

While, according to Sachet (*op. cit.*, p. 11), the collections of Arundel were the first to have been described in the scientific literature of the island, the crabs were not among the groups reported upon. It was therefore with considerable interest that the writer learned of the existence of two specimens of Arundel's collecting among unstudied collections at the U. S. National Museum, to which they had been forwarded from the California Academy of Sciences in 1948, along with Pacific material collected by the *Albatross*. The first of these, *Grap-sus grapsus*, had not been reported previously from Clipperton, although it can not have been unobserved there. The second proved to be the ubiquitous *Gecarcinus planatus*. Thus what were probably the first brachyurans collected at Clipperton Island, the Arundel specimens, are being reported simultaneously with the most recent specimens known to have been collected there, those of the I.G.Y. Clipperton Island Expedition. The addition of *Portunus (Achelous) affinis*, obtained by the Inter-American Tropical Tuna Commission in Clipperton Island waters in February, 1958, brings the total insular brachyuran fauna to 34 species.

The brachyuran material collected by the 1958 Clipperton Island Expedition will be distributed among the following institutions, with due regard to the contribution of representatives of each in collecting, sorting, distributing, and identifying the specimens: the Scripps Institution of Oceanography (SIO), La Jolla; the Natural History Museum, San Diego (SDMNH); the Allan Hancock Foundation (AHF), Los Angeles; the United States National Museum (USNM), Washington; and the Muséum National d'Histoire Naturelle, Paris (MNHN). The specimens of corals mentioned as hosts for crab commensals have already been deposited in the University of California Museum of Paleontology (UCMP), Berkeley.

ACKNOWLEDGMENT

The writer is indebted to Dr. Carl L. Hubbs of the Scripps Institution of Oceanography, who arranged for him to study the present collection, and to the late Conrad Limbaugh, who personally delivered the major part of it to the Allan Hancock Foundation before departing on his final journey to Monaco and to France. He is also grateful to Dr. Fenner A. Chace, Jr., who relinquished the

MUS. COMP. ZOO.
LIBRARY

AUG 11 1965

brachyuran material sent to the U. S. National Museum upon learning of the writer's prior claim. He wishes to thank the following expedition members who made additional specimens and personal notes available: Dr. Marie-Hélène Sachel for notes on *Gecarcinus planatus*; Mr. C. R. Harbison for a collection of dried crabs from supratidal levels; Dr. Ernst S. Reese for crabs collected from corals and for habitat notes; Dr. Edwin C. Allison for additional specimens of *Troglocarcinus* and information concerning its host. Special thanks are due to Dr. R. Serène for identifying the first specimen of *Troglocarcinus* from the eastern Pacific, to Prof. W. Stephenson for examining and reporting on the *Thalassidroma* species, and to Mr. Frank G. Alverson of the Inter-American Tropical Tuna Commission and Mr. Eugene L. Nakamura of the Bureau of Commercial Fisheries, U. S. Fish and Wildlife Service, for information concerning the migratory habits and digestive rates of the fish from whose stomachs the specimens of *Portunus (Achelous) affinis* were extracted.

GEOGRAPHICAL CONSIDERATIONS

With few exceptions, the islands of the eastern tropical Pacific, from the Revilla Gigedos to the Galápagos, have been treated by American workers in a purely American context. That this was too restricted a concept, particularly as regards Clipperton Island, became increasingly apparent during the course of this study as one species after another proved to be of west-Pacific origin or derivation. This should not have been surprising, for perhaps no other island in the eastern Pacific is so favorably situated to receive migrants from the western Pacific, or to provide the accustomed habitat once they have arrived. Accordingly, Clipperton Island may be said to belong neither to the Panamic nor to the Polynesian fauna alone, but to both, since each has contributed substantially to its microcosm.

An evaluation of the trans-Pacific increment called for extralimital experience, supplied by two summers' field work in the Marshall Islands, with observations in Hawaii while en route. Familiarity with the Indo-Pacific coral reef fauna at Eniwetok, an atoll in the western Pacific, facilitated recognition of the west-Pacific element present at Clipperton, the only atoll in the eastern Pacific, and made possible the assignment of each species to its characteristic habitat despite the paucity of accompanying ecological data. It also provided a working acquaintance with the voluminous and scattered literature needed to identify the non-American species, for which no encompassing monograph exists, and to determine their provenance.

The references given in the synonymies, aside from the original description and first use of the name in its present combination, are largely those that report the occurrence of the species at one or more of the islands nearest to Clipperton, either on the Polynesian or American side. Where the occurrence is a west-Pacific one, the islands most frequently mentioned are Hawaii, the Line Islands,

the Marquesas, Tahiti, and the Tuamotus. Where the occurrence is an east-Pacific one, the islands are Cape San Lucas, whose insular nature as regards warm-water, current-borne species has been developed in an earlier paper (Garth, 1960), the Revilla Gigedos, where it has been found advisable to anticipate the publication of records of Indo-Pacific species encountered by Hancock Expeditions at Clarion and/or Socorro Island which would otherwise appear restricted to Clipperton in the eastern portion of their range, Cocos, Malpelo, and the Galápagos. Such information, supplemented by an increasing knowledge of current patterns in the eastern Pacific, should lead to an eventual understanding of the routes by which larval stages of littoral species have arrived and have been dispersed. (See also discussion under Distribution following Account of Species.)

THE FAUNA AS KNOWN

The Clipperton Island brachyuran fauna as presently known consists of 34 species, 26 genera, and 9 families, of which 22 species, 17 genera, and 4 families are here reported for the first time. Of the 34 species, 16 (shown with an asterisk) are Indo-Pacific, and of these, 9 have not attained the American mainland. Species earlier reported are shown in the right-hand columns by author and date; those in the left-hand column were obtained by the 1956 and 1958 expeditions and are included in the present report.

LIST OF CLIPPERTON ISLAND BRACHYURA

	Lenz, 1901	Rathbun, 1902	Schmitt, 1939	Hertlein and Emerson, 1957
DYNOMENIDAE				
<i>Dynomene ursula</i> Stimpson				
CALAPPIDAE				
* <i>Calappa hepatica</i> (Linnaeus)				
HAPALOCARCINIDAE				
* <i>Hapalocarcinus marsupialis</i> Stimpson				
* <i>Troglocarcinus crescentus</i> (Edmondson)				
MAJIDAE				
<i>Herbstia pubescens</i> Stimpson				
<i>Teleophrys cristulipes</i> Stimpson				x
PORTUNIDAE				
* <i>Thalamita picta</i> Stimpson				x
<i>Portunus (Achelous) affinis</i> (Faxon)				
<i>Portunus (Achelous) tuberculatus</i> (Stimpson)				
<i>Cronius ruber</i> (Lamarck)				
XANTHIDAE				
* <i>Carpilius convexus</i> (Forskål)				
* <i>Carpilodes cinctimanus</i> (White)				
<i>Platypodia rotundata</i> (Stimpson)				x

	Lenz, 1901	Rathbun, 1902	Schmitt, 1939	Hertlein and Emer- son, 1957
<i>Actaea dovii</i> Stimpson			x	x
<i>Actaea sulcata</i> Stimpson			x	x
<i>Actaea</i> species				
<i>Cycloxanthops vittatus</i> (Stimpson)				
<i>Leptodius cooksoni</i> Miers				
<i>Micropanope xantusii</i> (Stimpson)			x	x
<i>Micropanope</i> species				
<i>Pilumnus xantusii</i> Stimpson				
* <i>Domecia hispida</i> Eydoux and Souleyet				
* <i>Trapezia digitalis</i> Latreille				x
* <i>Trapezia ferruginea</i> Latreille				x
GRAPSIDAE				
<i>Grapsus grapsus</i> (Linnaeus)				
* <i>Geograpsus lividus</i> (Milne Edwards)		x	x	x
* <i>Pachygrapsus minutus</i> A. Milne Edwards			x	x
* <i>Pachygrapsus planifrons</i> de Man				
* <i>Plagusia depressa tuberculata</i> Lamarck				
* <i>Plagusia speciosa</i> Dana				
* <i>Percnon abbreviatum</i> (Dana)			x	
<i>Percnon gibbesi</i> (Milne Edwards)				
GECARCINIDAE				
<i>Gecarcinus planatus</i> Stimpson	x		x	x
OCYPODIDAE				
* <i>Ocyrode ceratophthalma</i> (Pallas)				
Total species	34	1	1	10
				9

ACCOUNT OF SPECIES²

Subsection GYMNOPLEURA
Superfamily DROMIDEA
Family DYNOMENIDAE

***Dynomene ursula* Stimpson.**

Dynomene ursula STIMPSON, 1860b, p. 239 (Cape San Lucas). RATHBUN, 1937, p. 54, pl. 12, figs. 1-4 (Galápagos). SCHMITT, 1939, p. 25 (Galápagos). GARTH, 1946, p. 349, pl. 61, figs. 5, 6; 1948, p. 16.

RANGE. Gulf of California, Mexico, to La Plata Island, Ecuador. Galápagos Islands. Shore to 70 fathoms.

MATERIAL. Clipperton Island: Northeast side, 45 feet; August 28, 1958; C. Limbaugh, T. Chess, and A. Hambly: 1 male, 2 females (1 ovigerous), 3 young.

MEASUREMENTS. Largest specimen, male: length 13.7 mm., width 17.5 mm.

² All figures are of Clipperton Island specimens of Indo-Pacific species.

Female: length 9.7 mm., width 12.3 mm.; ovigerous female: length 13.5 mm., width 17.9 mm. Young: length 4.2 mm., width 4.9 mm.

HABITAT. *Pocillopora* coral.

REMARKS. Not previously reported from Clipperton Island.

Subsection OXYSTOMATA

Family CALAPPIDAE

Calappa hepatica (Linnaeus).

(Figures 9, 10.)

Cancer hepaticus LINNAEUS, 1764, p. 448 (The Indies); 1766, p. 1048.

Calappa tuberculata FABRICIUS, 1798, p. 345. OWEN, 1839, p. 80 (Oahu, Hawaii). HELLER, 1865, p. 69 (Tahiti).

Calappa hepatica, DE HAAN, 1837, p. 70. NOBILI, 1907, p. 378 (Tuamotu). BOONE, 1934, p. 32, pls. 8-10, synonymy (Marquesas).

RANGE. Indo-Pacific from the Red Sea and Natal to Hawaii, Tuamotu, and the Marquesas.

MATERIAL. Clipperton Island: October, 1956; C. Limbaugh: 1 male, 2 carapaces. August, 1958; E. S. Reese: 1 male; coral reef: 1 male. South shore: August 19, 1958; E. S. Reese, W. Baldwin, and C. Limbaugh: 1 male. North-west end, high tidepool; August 24, 1958; E. S. Reese, W. Baldwin, and J. Wintersteen: 1 male. Northeast side, in sand; depth 1 foot at low tide; August 31, 1958; C. Limbaugh: 3 young females. West shore, on beach; September 16, 1958: 1 carapace.

MEASUREMENTS. Largest specimen, male: length 37.0 mm., width 59.5 mm. Largest female: length 25.6 mm., width 38.5 mm.

HABITAT. Taken in a variety of situations, as indicated above. Its absence from the lagoon, its customary habitat in atolls of the western Pacific, is due no doubt to the increasing freshness of Clipperton Lagoon.

REMARKS. This widely ranging Indo-Pacific species may now be reported from Clipperton Island on the strength of eight specimens taken on at least four different occasions. It appears well established on the atoll.

Subsection HAPALOCARCINIDEA

Family HAPALOCARCINIDAE

Hapalocarcinus marsupialis Stimpson.

(Figures 1, 2.)

Hapalocarcinus marsupialis STIMPSON, 1859, p. 412 (Hilo, Hawaii); 1907, p. 170, pl. 14, fig. 8. EDMONDSON, 1923, p. 24 (Palmyra). SCHMITT, 1936, p. 34, figs. 36a-f (Port Utria, Colombia). RATHBUN, 1937, p. 259, pl. 79, figs. 3-9; text-fig. 46, synonymy (Secas Islands, Panama).

RANGE. Indian and western Pacific oceans east to Hawaii and Palmyra Island. Eastern Pacific at Panama and Colombia.

MATERIAL. Clipperton Island: August, 1958; E. S. Reese: 5 galls in 3 pieces of dry *Pocillopora* coral; 2 ovigerous females. Northeast transect, 36 feet; August 27, 1958; T. Chess and A. Hambly: 2 galls in *Pocillopora* coral; 3 ovigerous females.

MEASUREMENTS. Ovigerous females: length 3.1 mm., width 3.8 mm.; length 4.7 mm., width 4.6 mm.; and length 3.7 mm., width 5.0 mm. Considerable difference in relative lengths and widths was noted.

HABITAT. *Pocillopora* coral, in which it forms galls. The remaining coral genera listed by Edmondson (1923) as hosts to *Hapalocarcinus* in the central and western Pacific, namely, *Scriatopora*, *Stylophora*, *Sideropora*, and *Millepora*, are not among recent stony corals of the eastern Pacific enumerated by Durham and Barnard (1952, p. 13).

REMARKS. In view of the earlier discovery by the *Velero III* of the coral gall crab on the American mainland (Schmitt, 1936), and its apparent absence from the Galápagos Islands, where *Pocillopora* coral was collected with equal diligence by Hancock expeditions, it is of interest to find this obligate commensal established at Clipperton Island. Apparently Clipperton, rather than the Galápagos, has served as the stepping stone enabling *Hapalocarcinus marsupialis* to bridge the central Pacific oceanic barrier.

Troglocarcinus (Troglocarcinus) crescentus (Edmondson).

(Figures 3, 4, 5, 6.)

Cryptochirus crescentus EDMONDSON, 1925, p. 33, text-fig. 6, pls. B, C (Johnston Island).

Troglocarcinus (Troglocarcinus) crescentus, FIZE AND SERÈNE, 1957, p. 62, text-figs. 10, 11c, 11d, 12b, pl. 3, figs. 4-7, pl. 5, fig. 2, pl. 11, fig. B, synonymy and distribution (Nha-Trang, Viet Nam).

RANGE. Western Pacific from Hong Kong, the Palao Islands, and Viet Nam to Johnston Island. Undoubtedly distributed throughout the Indo-Pacific, wherever *Pavona* occurs.

MATERIAL. Clipperton Island: Northeast transect, 78 feet; August 27,

FIGURE 1. Gall of *Hapalocarcinus marsupialis* Stimpson on *Pocillopora elegans* showing respiratory apertures of female crab imprisoned within.

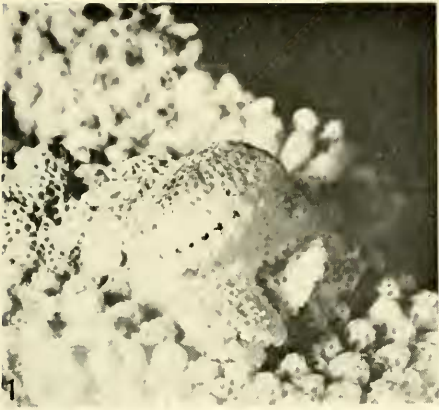
FIGURE 2. Same as figure 1.

FIGURE 3. *Troglocarcinus crescentus* (Edmondson) in *Pavona varians* Verrill from 15-20 meters, showing method of concealment.

FIGURE 4. Same as figure 3 but enlarged to show characteristic shape of opening.

FIGURE 5. *Troglocarcinus crescentus* (Edmondson) in *Pavona clivosa* Verrill from 15-20 meters, showing entire crab in dorsal view with enlarged inset.

FIGURE 6. Same as figure 5, showing crab at entrance to crescent-shaped burrow, enlarged inset.



1958; C. Limbaugh: 1 female, without record of host. Fifteen to 20 meters; August 1958; E. C. Allison: 2 dried specimens, on *Pavona* (UCMP no. B-6102).

MEASUREMENTS. Female, non-ovigerous: length 4.0 mm., width 3.2 mm.

HABITAT. Massive corals of the genus *Pavona*, in which they form tunnels of characteristic shape for each species, those of *Troglocarcinus* (*T.*) *crescentus* being crescentic. The opening is closed by the anterior portion of the carapace and the meri of the first pair of walking legs, which together form an operculum.

REMARKS. According to Dr. R. Serène, authority on the Hapalocarcinidae, to whom the 4 mm. female was submitted, the specimen belongs to the genus *Troglocarcinus* by the presence of three pairs of pleopods, to the subgenus *Troglocarcinus* by its dorsoventrally flattened carapace and exposed walking legs, and to the group within the subgenus having the walking legs broad and the opening of the lodging crescent-shaped. The first walking leg is characterized by having the superodistal angle of the merus prolonged into a small lobe, and the dactyl strongly curved into a short hook, modifications related to the position taken by the animal to close, as by an operculum, the crescent-shaped gallery that it occupies.

Characters that separate it from *Troglocarcinus* (*T.*) *viridis* Hiro, which has a third maxilliped of similar form, are the subquadrangular carapace, the short, straight anterolateral margins, forming an angle with the true lateral margins, and the inclination of the anterior dorsal $\frac{1}{2}$ of the carapace, with which the posterior dorsal $\frac{1}{2}$ forms a junction outlining a transverse crest.

Details of structure of the Clipperton Island specimen not agreeing exactly with the species as heretofore defined are a less distinct relief and less spinulation. The crescent-shaped cavity of the inclined anterior part of the carapace is indicated by two feeble depressions only, while the spinules of the carapace and appendages are reduced to tubercles with the tips obliterated. These differences are considered by Dr. Serène as in no way justifying the definition of a new form (species or variety), since they do not surpass the modifications of aging.

Although the specimen was submitted to Dr. Serène without notation as to its host, he was able to predict that it would be found in coral of the genus *Pavona*. Alerted to this possibility, Dr. Edwin C. Allison, then studying the expedition corals, was able to locate two more specimens of the crab, the one inside, the other outside its characteristic crescent-shaped gallery (see figures 4 and 6). He was also able to establish the host of *Troglocarcinus* (*T.*) *crescentus* at Clipperton Island as *Pavona* of at least two species: *P. varians* Verrill 1864 and *P. clivosa* Verrill 1869.

The genus *Troglocarcinus* is now recorded for the first time from the eastern Pacific, joining *Hapalocarcinus* as a second representative of the Indo-Pacific family Hapalocarcinidae.

Subsection BRACHYGNATHA

Superfamily OXYRHYNCHA

Family MAJIDAE

***Herbstia pubescens* Stimpson.**

Herbstia pubescens STIMPSON, 1871, p. 92 (Manzanillo, Mexico). GARTH, 1958, p. 308, pl. S, fig. 7, pl. 34, fig. 3, synonymy.

RANGE. West coast of Mexico (Stimpson). Otherwise, Costa Rica to Ecuador.

MATERIAL. Clipperton Island: Northeast transect, 78 feet; August 27, 1958; C. Limbaugh: 1 young. Northeast side, 45 feet, coral; August 28, 1958; C. Limbaugh, T. Chess, and A. Hambly: 2 post-ovigerous females.

MEASUREMENTS. Female: length 14.0 mm., width 10.1 mm. Young: length about 2.8 mm.

HABITAT. *Pocillopora* coral.

REMARKS. When compared with specimens in the collections of the Allan Hancock Foundation, Clipperton Island specimens agreed with *H. pubescens* from Secas Islands, Panama, rather than with *H. pyriformis* (Bell) from Galápagos Islands. It is therefore the mainland species, rather than its insular derivative, that occurs at Clipperton.

***Teleophrys cristulipes* Stimpson.**

Teleophrys cristulipes STIMPSON, 1860a, p. 133; 1860b, p. 190, pl. 2, fig. 2 (Cape San Lucas).

RATHBUN, 1902, p. 284 (Galápagos). SCHMITT, 1939, p. 22 (Clipperton). CRANE, 1947, p. 73 (Clarion). GARTH, 1958, p. 379, pl. W, fig. 1, pl. 42, fig. 3, synonymy (Socorro).

RANGE. Gulf of California, Mexico, to Ecuador. Clarion, Socorro, Clipperton, and Galápagos Islands.

MATERIAL. Clipperton Island: northeast side, 45 feet, coral; August 28, 1958; C. Limbaugh, T. Chess, and A. Hambly: 2 males, 5 females (4 ovigerous). Northeast corner, 45 feet, coral; August 30, 1958; same collectors: 1 ovigerous female. East side, reef flat margin or ridge, 0-2 feet; September 14, 1958; C. Limbaugh and T. Chess: 1 ovigerous female.

MEASUREMENTS. Largest male: length 6.4 mm., width 6.6 mm.; largest ovigerous female: length 8.3 mm., width 9.0 mm. Largest female from coral: length 8.0 mm., width 8.3 mm.

HABITAT. *Pocillopora* coral, but also free-living.

REMARKS. One of the most ubiquitous of the smaller spider crabs, *Teleophrys cristulipes* has been recorded from all the major outlying islands of the eastern tropical Pacific. It was first taken at Clipperton by the Presidential Cruise of 1938.

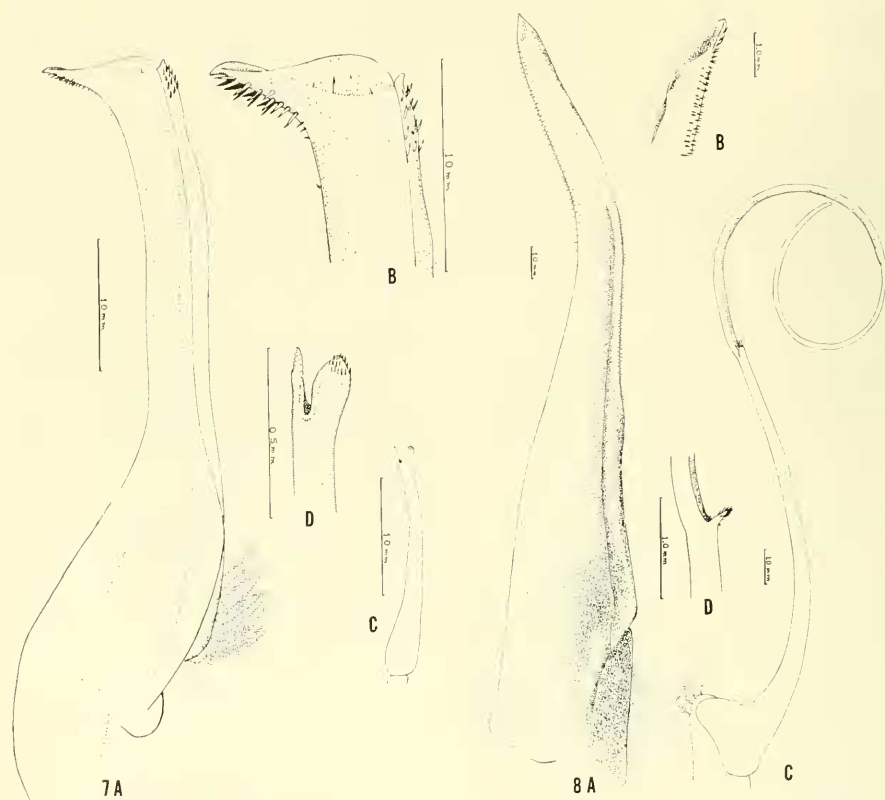


FIGURE 7. *Thalamita picta* Stimpson, male; A and B, first pleopod; C and D, second pleopod. Drawing by Ernest R. Tinkham.

FIGURE 8. *Carpilus convexus* (Forskål), male; A and B, first pleopod; C and D, second pleopod. Drawing by Ernest R. Tinkham.

Superfamily BRACHYRHYNCHA
Family PORTUNIDAE

***Thalamita picta* Stimpson.**

(Figures 7, 11, 12.)

Thalamita picta STIMPSON, 1858a, p. 39 (*Ad insulam "Ousima"*). STEPHENSON AND HUDSON, 1957, p. 344, figs. 2A, 3A; pl. 4, fig. 2; pls. 8K, 10I, synonymy and distribution. FOREST AND GUINOT, 1961, p. 33 (Tahiti).

Thalamita gardineri BORRADALE, 1902, p. 205, text-fig. 36 (Minikoi).

Thalamita alcocki DE MAN, 1902, p. 646 (Ternate).

Thalamita roosevelti SCHMITT, 1939, p. 16, text-fig. 2 (Clipperton).

RANGE. From Mozambique and the Red Sea to Hawaii, Tahiti, and the Tuamotus. Clipperton Island.



FIGURE 9. *Calappa hepatica* (Linnaeus), male, dorsal view. Scale in millimeters.

FIGURE 10. Same, ventral view. Scale in millimeters.

MATERIAL. Clipperton Island: October, 1956; C. Limbaugh: 1 young male. Coral reef; August, 1958; E. S. Reese: 3 males. South shore, coral reef, sand; August 11, 1958; E. S. Reese, C. Limbaugh, W. Baldwin, and J. Wintersteen: 5 males. East end, coral reef; August 15, 1958; E. S. Reese, W. Baldwin, and J. Wintersteen: 13 males, 11 females (6 ovigerous), 8 young. South shore, coral reef; August 19, 1958; E. S. Reese, W. Baldwin, and C. Limbaugh: 3 males, 2 females. Northeast side, low intertidal to 6 inches; September 4, 1958; C. Limbaugh, T. Chess, and A. Hambly: 3 males. Northeast side, low tide, reef flat (collected with "Endrin"); September 13, 1958; C. Limbaugh, T. Chess, and A. Hambly: 44 males, 45 females (34 ovigerous), 2 young. East side, reef flat margin or ridge, 0-2 feet; September 14, 1958; C. Limbaugh and T. Chess: 1 ovigerous female.

MEASUREMENTS. Largest specimen, male: length 18.2 mm., width including spines 29.0 mm., without spines 26.3 mm. Largest female, ovigerous, length 15.6 mm., width including spines 25.1 mm., without spines 22.8 mm. Young from 2.5×3.2 mm.

HABITAT. The reef flat, from low intertidal to a depth of 2 feet.

REMARKS. The present series of 140 specimens provides a wealth of material with which to supplement the type series of *T. roosevelti*, which consisted of three specimens, of which at least two were immature. It contains the largest specimens recorded, as well as the smallest specimens, and the only ovigerous females, of what was believed to represent a Clipperton Island endemic species, but which now appears to be only an insular population of the widely ranging Indo-west Pacific *T. picta*.

Two male and two female specimens of the *Thalamita* from Clipperton Island described by Schmitt (1939) as *T. roosevelti* were sent for examination to Professor W. Stephenson of the University of Queensland, Australia, an authority on the Indo-west Pacific Portunidae. Of them Dr. Stephenson wrote: "After a careful examination of your specimens of *Thalamita roosevelti*, I can find no points of difference compared with *Thalamita picta*. This applies to all the details of general structure and also to the male pleopod. If the specimen had borne an Indian Ocean or west Pacific Ocean locality label, I should have named it as *T. picta* without hesitation. If *T. roosevelti* is not a synonym of *T. picta*, then the two are sibling species."

Dr. Stephenson also noted that he had included both *T. gardineri* Borradaile and *T. alcocki* de Man, species considered by Schmitt (1939, p. 16) to be most closely related to *T. roosevelti*, and with it constituting a three-species group, as synonyms of *T. picta* (Stephenson and Hudson, 1957, p. 344), having come to the conclusion that the latter was a somewhat variable species. It is therefore apparent that, while *T. roosevelti* might have been considered a good species in an earlier context in which *T. gardineri* and *T. alcocki* were also so considered, it now has no more reason to stand alone than they, and accordingly is synonymized to *T. picta*. The fact that *T. picta* goes further eastward than the majority of the Indo-west Pacific *Thalamita* species, reaching Tahiti (Forest and Guinot, 1961) and the Tuamotus (Holthuis, 1953), establishes it as a likely colonizer of an island outpost like Clipperton.

Portunus (Achelous) affinis (Faxon).

Achelous affinis FAXON, 1893, p. 155 (off Panama and Ecuador); 1895, p. 23.

Portunus (Achelous) affinis, RATHBUN, 1898, p. 595; 1930, p. 80, pls. 38, 39 (Cape San Lucas).

RANGE. Cape San Lucas, Mexico, to Ecuador.

MATERIAL. Vicinity of Clipperton Island: February, 1958; removed from yellowfin tuna 1126 mm.; M.V. *Agressor* sample no. 15; F. G. Alverson, Inter-American Tropical Tuna Commission: 4 males, 5 females. Specimens returned to U. S. National Museum following verification of identification made by F. A. Chace, Jr.

MEASUREMENTS. Largest specimen, male: length 24.4 mm., width 38.5 mm. Largest female: length 21.9 mm., width 35.0 mm.

HABITAT. Pelagic.

REMARKS. The finding of recognizable specimens of *Portunus (Achelous) affinis* in the stomach of a yellowfin tuna caught in the immediate vicinity of Clipperton Island raises the question of how far the fish might have traveled since ingesting the crabs, which are common in offshore Mexican waters. The question is answered in part by Eugene L. Nakamura, fisheries biologist, whose

experiments with Hawaiian skipjack indicate a lapse of only 1 hour and 25 minutes between the feeding of shrimp and the appearance of the undigested exoskeletons in the fecal pellets. Frank G. Alverson, senior scientist of the Inter-American Tropical Tuna Commission, thinks that the rate of digestion for the yellowfin, while slower, is probably not more than two or three times as slow as for the skipjack. This relatively rapid digestive rate would rule out the possibility that the crabs were ingested near the mainland and transported by the tuna to Clipperton Island. Rather, the evidence suggests that the portunids were eaten within a very few miles of the place at which the fish was caught. It is for this reason that *Portunus (Achelous) affinis* is included in this report, which deals otherwise with specimens collected on or from Clipperton Atoll.

***Portunus (Achelous) tuberculatus* (Stimpson).**

Achelous tuberculatus STIMPSON, 1860b, p. 223 (Cape San Lucas).

Portunus (Achelous) tuberculatus, RATHBUN, 1898, p. 596 (Panama); 1930, p. 90, pl. 44. FINNEGAN, 1931, p. 629 (Gorgona Island). CRANE, 1937, p. 68 (San Lucas Bay). GARTH, 1946, p. 421, pl. 71, fig. 2 (Galápagos); 1948, p. 34 (Ecuador).

RANGE. Cape San Lucas, Mexico, to Ecuador. Galápagos Islands.

MATERIAL. Clipperton Island: Northeast corner, 45 feet; August 30, 1958; C. Limbaugh, A. Hambly, and T. Chess: 1 young female.

HABITAT. From *Pocillopora*.

MEASUREMENTS. Young female: length 10.4 mm., width including spines 21.2 mm., without spines 16.7 mm.

REMARKS. Of small size and with distinctive ornamentation, including a spine at the posterolateral angles of the carapace, *Portunus (Achelous) tuberculatus* is easily recognizable among eastern Pacific portunids. It had not been recorded from Clipperton previously.

***Cronius ruber* (Lamarck).**

Portunus ruber LAMARCK, 1818, p. 260 (Brazil).

Cronius ruber, STIMPSON, 1860b, p. 225 (Panama). RATHBUN, 1924, p. 159 (Galápagos); 1930, p. 139, pls. 62, 63, synonymy (Peru). FINNEGAN, 1931, p. 630 (Gorgona Island, Colombia). GARTH, 1946, p. 422, pl. 72, figs. 3, 4; 1948, p. 36 (La Plata Island, Ecuador). HOLTHUIS, 1954, p. 28, text-fig. 10 (El Salvador).

RANGE. Lower California, Mexico, to Peru. Galápagos Islands. Occurs also in the Atlantic.

MATERIAL. Clipperton Island: Splash zone; September 6, 1958; C. Limbaugh: 1 left cheliped. Northeast side, low tide, reef flat, 0–1 foot; September 13, 1958; C. Limbaugh, T. Chess, and A. Hambly: 1 male.

MEASUREMENTS. Male specimen: length 20.2 mm., width including spines 32.0 mm., without spines 29.4 mm.

HABITAT. Reef flat, intertidal, to 1 foot.



FIGURE 11. *Thalassidroma picta* Stimpson, male, dorsal view. Scale in millimeters.

FIGURE 12. Same, ventral view. Scale in millimeters.

FIGURE 13. *Carpilus convexus* (Forskål), male, dorsal view. Scale in millimeters.

REMARKS. The male specimen was collected with "Endrin." The detached cheliped is identifiable by the four spines on the manus. The *Portunus* species with which *Cronius ruber* might be confused have only two spines on the manus. The species is now recorded from Clipperton Island.

Family XANTHIDAE

Carpilus convexus (Forskål).

(Figures 8, 13.)

Cancer convexus FORSKÅL, 1775, p. 88 (Red Sea).

Carpilus convexus, RÜPPELL, 1830, p. 13, pl. 3, fig. 2; pl. 6, fig. 6 (Tahiti). DANA, 1852, p.

159; 1855, pl. 7, fig. 5 (Sandwich Islands). BOONE, 1934, p. 89, pls. 43-45, synonymy. EDMONDSON, 1962, p. 223, fig. 1b.

RANGE. Indo-Pacific from Red Sea to Hawaii and Tahiti.

MATERIAL. Clipperton Island: From gut of bass, *Dermatolepis punctata*; August 12, 1958; E. S. Reese: 1 female. In trap, 30-100 feet; August 23-26, 1958; E. S. Reese, W. Baldwin, and J. Wintersteen: 1 male. West shore; September 17, 1958; T. Chess: 1 carapace. On beach, W. side; September 21, 1958; C. Limbaugh: 1 male, lacking walking legs and abdomen.

MEASUREMENTS. Largest specimen, male: length 68.2 mm., width 90.4 mm. Female: length 34.2 mm., width 48.0 mm.

HABITAT. The one living specimen was caught in a trap set at a depth of from 30 to 100 feet. The others were either cast up on the beach or were obtained from a fish's stomach, indicating origin below tidal level.

REMARKS. The finding of four specimens of *Carpilius convexus*, a widely ranging Indo-Pacific species, at Clipperton Island would seem to indicate that it has not only crossed the Central Pacific oceanic barrier from Hawaii, the Line Islands, or Tahiti, but that it is well established there. Only an ovigerous female is lacking as proof of a breeding population, the single female collected being immature.

Comparison with the Atlantic species, *Carpilius corallinus* (Herbst), from Brazil in the collection of the U. S. National Museum (USNM no. 40576) shows differences best indicated by the following table:

C. convexus

1. Frontal lobes separated from lateral lobes by a shallow, broad sinus; lateral lobes directed outward.
2. Supraorbital margins thick, rimmed.
3. Anterolateral portion of carapace rugose.
4. Anterolateral margins moderately thickened, rimmed.
5. Male abdomen narrow, tip with length and breadth equal, sides convex.
6. Walking legs somewhat more slender; meri not noticeably thickened proximally.

C. corallinus

1. Frontal lobes separated from lateral lobes by a deep, U-shaped sinus; lateral lobes directed forward.
2. Supraorbital margins thick, not rimmed.
3. Anterolateral portion of carapace punctate only.
4. Anterolateral margins very thick, not rimmed.
5. Male abdomen wider, especially at bases of somites 3 and 7; tip broader than long, sides concave.
6. Walking legs robust; meri thickened proximally.

On the other hand, specimens from Clipperton Island agree well with specimens of *Carpilius convexus* in Hancock collections from the Marshall Islands and Hawaii. The absence of *Carpilius* from the west coast of tropical America is therefore the more remarkable in view of the fact that the greater distance

from the mid-Pacific islands to Clipperton has been negotiated, whereas the lesser distance from Clipperton to the American mainland has not been bridged.

Carpilodes cinctimanus (White).

Carpilius cinctimanus WHITE, 1847a, p. 336, pl. 2, fig. 3 (Indian Ocean and Eastern Seas); 1847b, p. 14.

Carpilodes cinctimanus, MIERS, 1880, p. 234; 1886, p. 133. RATHBUN, 1930, p. 242, pl. 100. CRANE, 1937, p. 69 (Arena Bay, Gulf of California); 1947, p. 74. GARTH, 1946, p. 426, pl. 74, figs. 1-4; 1948, p. 38 (Gorgona Island, Colombia). BUITENDIJK, 1960, p. 256, text-fig. 2a.

Liomera cocosana BOONE, 1927, p. 184, text-fig. 63 (Cocos and Galápagos).

RANGE. Indo-Pacific from Gulf of Aden eastward. Eastern Pacific from Gulf of California, Mexico, to Colombia. Cocos Island and Galápagos Islands.

MATERIAL. Clipperton Island: October, 1956; C. Limbaugh: 1 female. Northeast transect, 36 feet; August 27, 1958; T. Chess and A. Hambly: 1 female. Northeast side, 45 feet, *Pocillopora* coral; August 28, 1958; C. Limbaugh, T. Chess, and A. Hambly: 1 female. East side, reef flat margin or ridge, 0-2 feet; September 14, 1958; C. Limbaugh and T. Chess: 1 female.

MEASUREMENTS. Largest specimen, female: length 18.0 mm., width 32.3 mm.

HABITAT. The *Pocillopora* coral colony.

REMARKS. Of undoubted Indo-Pacific origin, but well established on the tropical American west coast, as well as at outlying islands of Cocos and Galápagos, this unmistakable concomitant of the coral colony may now be reported from Clipperton.

Platypodia rotundata (Stimpson).

Atergatis rotundatus STIMPSON, 1860b, p. 202 (Cape San Lucas).

Platypodia rotundata, RATHBUN, 1910, p. 584; 1930, p. 248, pl. 102, figs. 1-3 (Ecuador).

FINNEGAN, 1931, p. 633 (Galápagos). SCHMITT, 1939, p. 21 (Clipperton). GARTH, 1946, p. 430; 1948, p. 38 (Humboldt Bay, Colombia). HERTLEIN AND EMERSON, 1957, p. 5 (Clipperton).

RANGE. Gulf of California, Mexico, to Ecuador. Galápagos Islands; Clipperton Island.

MATERIAL. Clipperton Island: December 12, 1954; R. L. Fisher, J. B. Jordan, and S. O'Neil: 2 young. East end, coral reef; August 15, 1958; E. S. Reese, W. Baldwin, and J. Wintersteen: 1 young female. Northeast side, reef flat, low tide, 0-1 foot; September 13, 1958; C. Limbaugh, T. Chess, and A. Hambly: 1 female, collected with "Endrin."

MEASUREMENTS. Female specimen: length 5.3 mm., width 7.8 mm. Young: length 2.2 mm., width 3.1 mm.

HABITAT. Low intertidal, to 1 foot. Often encountered in sponges.

REMARKS. The present record is the third for Clipperton, the species having been obtained by both the Scripps Expedition of 1954 aboard the *Spencer F. Baird* and the Presidential Cruise of 1938 aboard the *Houston*. The young specimens are sharply granulate.

Actaea sulcata Stimpson.

Actaea sulcata STIMPSON, 1860b, p. 203 (Cape San Lucas). RATHBUN, 1930, p. 259, pl. 105, figs. 3, 4. CRANE, 1937, p. 69 (Arena Bank, Gulf of California); 1947, p. 74. SCHMITT, 1939, p. 21 (Clipperton). GARTH, 1946, p. 434, pl. 77, fig. 1 (Galápagos); 1948, p. 39 (La Plata Island, Ecuador). BUITENDIJK, 1950, p. 276. HERTLEIN AND EMERSON, 1957, p. 5 (Clipperton).

RANGE. Gulf of California, Mexico, to Ecuador. Galápagos Islands and Clipperton Island.

MATERIAL. Clipperton Island: December 12, 1954; R. L. Fisher, J. B. Jordan, and S. O'Neil: 1 male, 1 female. October, 1956; C. Limbaugh: 1 male. Northwest end, reef; August 14, 1958; E. S. Reese, W. Baldwin, and J. Wintersteen: 1 female. South shore, coral reef; August 19, 1958; E. S. Reese, W. Baldwin, and C. Limbaugh: 1 female. Northeast transect, 36 feet, *Pocillopora* coral; August 27, 1958; T. Chess and A. Hambly: 1 female. Northeast side, 45 feet, *Pocillopora* coral; August 28, 1958; C. Limbaugh, T. Chess, and A. Hambly: 1 male, 1 female. Northeast corner, 45 feet, *Pocillopora* coral; August 30, 1958; C. Limbaugh, T. Chess, and A. Hambly: 1 male, 1 young female.

MEASUREMENTS. Largest specimen, female: length 11.7 mm., width 17.7 mm. Largest male: length 11.4 mm., width 17.1 mm. Young female: length 4.9 mm., width 7.2 mm. Young male: length 4.7 mm., width 7.0 mm.

HABITAT. The *Pocillopora* coral colony.

REMARKS. Previously collected by both the 1938 Presidential Cruise (Schmitt) and the 1954 Scripps Acapulco Trench Expedition (Hertlein and Emerson), *Actaea sulcata* was found whenever *Pocillopora* coral was obtained by the several skilled divers who accompanied the 1958 Scripps I.G.Y. Expedition. The largest female had the areoles more widely separated than is usual for the species; the other specimens were noted as having shallow sulci. This is evidence of weak endemism at the populational level.

Actaea dovii Stimpson.

Actaea dovii STIMPSON, 1871, p. 104 (San Salvador and Panama). RATHBUN, 1902, p. 281 (Galápagos); 1930, p. 254, pl. 104, figs. 1, 2. SCHMITT, 1939, pp. 21, 25 (Clipperton). GARTH, 1946, p. 431, pl. 79, figs. 2, 6; 1948, p. 38 (Colombia). CRANE, 1947, p. 74. HERTLEIN AND EMERSON, 1957, p. 5 (Clipperton).

RANGE. El Salvador to Ecuador. Galápagos Islands; Clipperton Island.

MATERIAL. Clipperton Island: December 12, 1954; R. L. Fisher, J. B. Jordan, and S. O'Neil: 1 young. Northeast transect, 36 feet, *Pocillopora* coral;

August 27, 1958; T. Chess and A. Hambly: 1 male. Northeast side, 45 feet, *Pocillopora* coral; August 28, 1958; C. Limbaugh, T. Chess, and A. Hambly: 1 male, 1 young. Without accompanying data: 1 female.

MEASUREMENTS. Male specimen: length 10.9 mm., width 15.6 mm. Female specimen: length 9.2 mm., width 13.3 mm. Young specimen: length 3.7 mm., width 5.3 mm.

HABITAT. The *Pocillopora* coral colony.

REMARKS. The species was obtained previously at Clipperton by both the U.S.S. *Houston* (Schmitt) and the *Spencer F. Baird* (Hertlein and Emerson).

Actaea species.

MATERIAL. Clipperton Island: Northeast transect, 78 feet; August 27, 1958; C. Limbaugh: 1 young.

MEASUREMENTS. Young specimen: length 1.8 mm., width 2.3 mm.

HABITAT. Probably from *Pocillopora* coral.

REMARKS. This tiny specimen, too young to permit positive identification, may represent a new species. It is close to, but not identical with, *Actaea angusta* Rathbun (1898, p. 582) of the Galápagos Islands.

Cycloxanthops vittatus (Stimpson).

Xantho vittata STIMPSON, 1860b, p. 206 (Panama and Cape San Lucas).

Cycloxanthops vittatus, RATHBUN, 1907, p. 70; 1930, p. 291, pl. 133, figs. 3, 4; pl. 134, fig. 3.

BOONE, 1927, p. 197, text-fig. 68 (Galápagos). SIVERTSEN, 1933, p. 15. GARTII, 1946, p. 445, pl. 79, fig. 5. CRANE, 1947, p. 75.

RANGE. Gulf of California, Mexico, to Panama. Galápagos Islands.

MATERIAL. Clipperton Island: October, 1956; C. Limbaugh: 1 male. Coral reef; August, 1958; E. S. Reese: 1 male. South shore, coral reef, sand; August 11, 1958; C. Limbaugh, W. Baldwin, and J. Wintersteen: 1 male. East end, coral reef; August 15, 1958; E. S. Reese, W. Baldwin, and J. Wintersteen: 1 male, 1 female, 1 young. Northeast side, reef flat, low tide, 0–1 foot; September 13, 1958; C. Limbaugh, T. Chess, and A. Hambly: 5 males, 8 females (1 ovigerous); collected with "Endrin."

MEASUREMENTS. Largest specimen, male: length 16.4 mm., width 24.4 mm. Largest female: length 12.7 mm., width 17.3 mm. Ovigerous female: length 11.8 mm., width 16.2 mm. Young: length 2.8 mm., width 3.2 mm.

HABITAT. Coral reef or reef flat at low tide, to a depth of 1 foot.

REMARKS. Known previously from the Galápagos Islands, as well as from a number of mainland localities, *Cycloxanthops vittatus* is now recorded from Clipperton Island, where a breeding population exists, as shown by the recovery of an ovigerous female and young. Success in obtaining this species in numbers may be attributed to poisoning with "Endrin." The vertical stripes of color

characteristic of this species are faintly visible on a male measuring 11.1 × 15.8 mm.

***Leptodius cooksoni* Miers.**

Leptodius cooksoni MIERS, 1877, p. 73, pl. 12, figs. 1, 1a-d (Charles Island, Galápagos).

RATHBUN, 1930, p. 310, pl. 142, synonymy (Socorro, Clarion). SIVERTSEN, 1933, p. 14.

SCHMITT, 1939, pp. 11, 25, 26. STEINBECK AND RICKETTS, 1941, p. 469 (Gulf of California). GARTH, 1946, p. 448, pl. 77, fig. 3; pl. 79, fig. 3.

Xanthodius lobatus, A. MILNE EDWARDS, 1880, p. 271, pl. 49, figs. 4, 4a, b (Chile).

Xantho cooksoni, BUITENDIJK, 1950, p. 277 (San José del Cabo).

RANGE. Gulf of California, Mexico. Socorro and Clarion islands; Galápagos Islands. Chile? (Apart from this all records are either insular or peninsular.)

MATERIAL. Clipperton Island: October, 1956; C. Limbaugh: 1 male. Northwest end, reef; August 14, 1958; E. S. Reese, W. Baldwin, and J. Wintersteen: 2 males, 2 females. South shore, coral reef; August 19, 1958; E. S. Reese, W. Baldwin, and C. Limbaugh: 1 male, 1 female. Northwest end, high tidepool; August 24, 1958; E. S. Reese, W. Baldwin, and J. Wintersteen: 7 males, 1 female. September 10-15, 1958; C. R. Harbison: 30 males, 18 females (3 ovigerous), 1 young.

MEASUREMENTS. Largest specimen, male: length 18.1 mm., width 30 mm. Largest female: length 15.3 mm., width 24.8 mm. Largest ovigerous female: length 9.8 mm., width 15.6 mm.; smallest ovigerous female: length 7.8 mm., width 12.1 mm. Young: length 6.0 mm., width 8.7 mm.

HABITAT. Reef and high tidepool.

REMARKS. Already reported from Socorro and Clarion islands to the northwest and from the Galápagos Islands to the southeast, it is not unexpected that *Leptodius cooksoni* should occur at Clipperton Island. What is remarkable is that it has not been found there before, in view of its apparent abundance. The series of nearly 50 specimens collected by C. R. Harbison of the San Diego Museum is noteworthy for the small size of the ovigerous females.

***Micropanope xantusii* (Stimpson).**

Xanthops xantusii STIMPSON, 1871, p. 105 (Cape San Lucas).

Micropanope xantusii, RATHBUN, 1930, p. 438, pl. 179, figs. 1-4, synonymy (Clarion). CRANE, 1937, p. 72 (Arena Bank, Gulf of California); 1947, p. 80. SCHMITT, 1939, p. 21 (Clipperton). GARTH, 1946, p. 457, pl. 77, fig. 6; 1948, p. 42 (La Plata Island, Ecuador). HERTLEIN AND EMERSON, 1957, p. 5 (Clipperton Island).

RANGE. Gulf of California, Mexico, to Ecuador. Galápagos Islands (see Garth, 1946, p. 459). Clarion Island. Clipperton Island.

MATERIAL. Clipperton Island: December 12, 1954; R. L. Fisher, J. B. Jordan, and S. O'Neil: 3 males, 1 female, 1 young (look different). October, 1956; C. Limbaugh: 1 male. Coral reef; August, 1958; E. S. Reese: 1 ovig-

erous female. Northeast side, west wall of "canyon," 45 feet; August 18, 1958; C. Limbaugh: 1 male. Northeast side, 45 feet, *Pocillopora* coral; August 28, 1958; C. Limbaugh, T. Chess, and A. Hambly: 3 males, 5 females (3 ovigerous), 2 young. Northeast corner, 45 feet, *Pocillopora* coral; August 30, 1958; C. Limbaugh, T. Chess, and A. Hambly: 4 males, 1 female. Northeast end, shore to 6 inches; September 4, 1958; C. Limbaugh, T. Chess, and A. Hambly: 1 male. Northeast side, reef flat, low tide, 0-1 foot; September 13, 1958; C. Limbaugh, T. Chess, and A. Hambly: 1 female. East side, reef flat margin or ridge, 0-2 feet; September 14, 1958; C. Limbaugh and T. Chess: 1 male. Northeast side, 50-60 feet; September 20, 1958; C. Limbaugh: 1 male.

MEASUREMENTS. Largest specimen, male: length 9.7 mm., width 14.1 mm. Largest female, ovigerous: length 8.9 mm., width 12.9 mm.; smallest ovigerous female: length 6.5 mm., width 9.0 mm. Young: length 3.0 mm., width 4.1 mm.

HABITAT. A common but not exclusive inhabitant of the *Pocillopora* coral colony.

REMARKS. This species was taken previously at Clipperton Island by both Schmitt (1939) and the *Spencer F. Baird* party (Hertlein and Emerson, 1957). Specimens are of large size, the chelipeds thick, almost without furrows. This is the "different look" remarked upon in connection with the 1954 specimens, again evidence of weak endemism.

Micropanope species.

MATERIAL. Clipperton Island: Northeast transect, 78 feet; August 27, 1958; C. Limbaugh: 1 young.

MEASUREMENTS. Young specimen: length 1.5 mm., width 1.9 mm.

HABITAT. Believed to be from *Pocillopora* coral.

REMARKS. The specimen is too immature to permit ready identification with any of the known *Micropanope* species.

Pilumnus xantusii Stimpson.

Pilumnus xantusii STIMPSON, 1860b, p. 213 (Cape San Lucas). RATHBUN, 1930, p. 486, pl. 201, figs. 1-3. GARTH, 1946, p. 471, pl. 59, figs. 1-5; pl. 79, fig. 4; 1948, p. 45 (La Plata Island, Ecuador). CRANE, 1947, p. 81.

Eriphides hispida, BOONE, 1927, fig. 87B (Galápagos). Not *Eriphides hispida* (Stimpson). *Pilumnus crosslandi* FINNEGAN, 1931, p. 643 (Galápagos).

RANGE. Lower California, Mexico, to Ecuador. Galápagos Islands.

MATERIAL. Clipperton Island: Twenty to 40 feet, coral; August, 1958; E. Allison and C. Limbaugh: 1 male, 1 female, 2 young. Northeast transect, 36 feet; August 27, 1958; T. Chess and A. Hambly: 1 male, 1 female. Northeast transect, 78 feet; August 27, 1958; C. Limbaugh: 3 males. Northeast side, 45 feet, *Pocillopora* coral; August 28, 1958; C. Limbaugh, T. Chess, and A. Hambly: 2 females, 3 young.

MEASUREMENTS. Largest specimen, female: length 8.5 mm., half-width 5.8 mm. Largest male: length 7.7 mm., width 9.6 mm. Young: length 2.0 mm., width 2.3 mm.

HABITAT. The *Pocillopora* coral colony, in the sublittoral.

REMARKS. Although previously reported from the Galápagos Islands (Boone, 1927, as *Eriphides hispida*, young; Finnegan, 1931, as *Pilumnus crosslandi*), *Pilumnus xantusii* had not been collected at Clipperton Island, probably because of the 20- to 78-foot depths at which it is found there.

***Domecia hispida* Eydoux and Souleyet.**

Domécie hérissée EYDOUX AND SOULEYET, 1842 (or 1843), Atlas, p. 2, figs. 5-10.

Domecia hispida EYDOUX AND SOULEYET, 1844 (or 1845), p. 235 (Sandwich Islands). RATHBUN, 1930, p. 554, pl. 227. FINNEGAN, 1931, p. 647 (Gorgona Island). CRANE, 1937, p. 73 (Arena Bank, Gulf of California); 1947, p. 82 (Clarion). GARTH, 1946, p. 489, pl. 81, fig. 5 (Galápagos); 1948, p. 50 (La Plata Island, Ecuador).

RANGE. Indo-west Pacific from Red Sea to Hawaii. Eastern Pacific from Gulf of California to Ecuador. Clarion Island. Galápagos Islands.

MATERIAL. Clipperton Island: Northeast side, west wall of "canyon," 45 feet; August 18, 1958; C. Limbaugh: 2 females (1 ovigerous). Northeast transect, 36 feet; August 27, 1958; T. Chess and A. Hambly: 1 ovigerous female, 1 young. Northeast transect, 78 feet; August 27, 1958; C. Limbaugh: 1 female, 1 young. Northeast side, 45 feet, *Pocillopora* coral; August 28, 1958; C. Limbaugh, T. Chess, and A. Hambly: 5 females, 6 young. Northeast side, 50-60 feet; September 20, 1958; C. Limbaugh: 2 males.

MEASUREMENTS. Largest specimen, ovigerous female: length 10.3 mm., width 13.6 mm. Largest male: length 4.0 mm., width 5.3 mm. Smallest ovigerous female: length 5.4 mm., width 6.9 mm. Smallest young: length 2.9 mm., width 3.6 mm.

HABITAT. The *Pocillopora* coral colony.

REMARKS. Of western Pacific origin but known from islands to the northwest and southeast and from the American mainland, *Domecia hispida* is now recorded from Clipperton Island.

***Trapezia digitalis* Latreille.**

Trapezia digitalis LATREILLE, 1825, p. 696 (Red Sea). RATHBUN, 1930, p. 559, pl. 228, figs. 5, 6, synonymy (Socorro, Clarion). SCHMITT, 1933, p. 22 (Galápagos). CRANE, 1937, p. 73 (Arena Bank, Gulf of California); 1947, p. 83. GARTH, 1946, p. 493, pl. 81, fig. 6; 1948, p. 51 (La Plata Island, Ecuador). HERTLEIN AND EMERSON, 1957, p. 5 (Clipperton). *Trapezia nigro-fusca* STIMPSON, 1860b, p. 219 (Cape San Lucas).

RANGE. Indo-west Pacific from Red Sea to Hawaii. Eastern Pacific from Gulf of California, Mexico, to Ecuador. Socorro and Clarion islands; Galápagos Islands; Clipperton Island.

MATERIAL. Clipperton Island: December 12, 1954; R. L. Fisher, J. B. Jordan, and S. O'Neil: 1 male, 1 female; 1 young (not measured). Northeast transect, 36 feet; August 27, 1958; T. Chess and A. Hambly: 2 males, 3 females (1 ovigerous). Northeast side, 45 feet, *Pocillopora* coral; August 28, 1958; C. Limbaugh, T. Chess, and A. Hambly: 6 males, 6 females (3 ovigerous). Northeast corner, 45 feet, *Pocillopora* coral; August 30, 1958; C. Limbaugh, T. Chess, and A. Hambly: 1 ovigerous female. Northeast side, 50–60 feet; September 20, 1958; C. Limbaugh: 1 young female.

MEASUREMENTS. Largest specimen, male: length 9.3 mm., width 11.5 mm. Largest female (ovigerous): length 8.3 mm., width 10.4 mm.; smallest ovigerous female: length 5.9 mm., width 7.6 mm. Young female: length 3.1 mm., width 4.4 mm.

HABITAT. Inhabits exclusively the *Pocillopora* coral colony.

REMARKS. Collected at Clipperton Island on the 1954 expedition of the *Spencer F. Baird*, *Trapezia digitalis* was found by the 1958 expedition whenever *Pocillopora* coral was obtained by diving.

Trapezia ferruginea Latreille.

Trapezia ferruginea LATREILLE, 1825, p. 695 (Red Sea). BUITENDIJK, 1950, p. 278.

Trapezia cymodoce ferruginea, RATHBUN, 1907, p. 58; 1930, p. 557, pl. 228, figs. 1, 2 (Clarion). BOONE, 1927, p. 240, text-fig. 88 (Cocos and Galápagos). CRANE, 1937, p. 73 (Arena Bank, Gulf of California); 1947, p. 83. GARTH, 1946, p. 491, pl. 81, fig. 4; 1948, p. 51 (La Plata Island, Ecuador). HERTLEIN AND EMERSON, 1957, p. 5 (Clipperton).

RANGE. Indo-west Pacific from Red Sea to Hawaii. Eastern Pacific from Gulf of California to Ecuador. Clarion Island. Galápagos Islands. Clipperton Island.

MATERIAL. Clipperton Island: December 12, 1954; R. L. Fisher, J. B. Jordan, and S. O'Neil: 3 males (not measured). October, 1956; C. Limbaugh: 1 ovigerous female. Twenty to 40 feet, in coral, sublittoral; August, 1958; E. Allison and C. Limbaugh: 17 males, 15 females (7 ovigerous). Shore; August 7–26, 1958; E. S. Reese: 1 male. Reef, NW. end; August 14, 1958; E. S. Reese, W. Baldwin, and J. Wintersteen: 1 male. Northeast side, west wall of "canyon," 45 feet; August 18, 1958; C. Limbaugh: 9 males, 7 females. Northeast transect, 36 feet; August 27, 1958; T. Chess and A. Hambly: 4 males, 6 ovigerous females, 3 young. Northeast side, 45 feet, *Pocillopora* coral; August 28, 1958; C. Limbaugh, T. Chess, and A. Hambly: 15 males, 20 females (10 ovigerous), 4 young. Northeast corner, 45 feet, *Pocillopora* coral; August 30, 1958; C. Limbaugh, T. Chess, and A. Hambly: 6 males, 13 females (8 ovigerous). East side, reef flat margin or ridge, 0–2 feet, *Pocillopora* coral; September 14, 1958; C. Limbaugh and T. Chess: 5 males, 3 females (2 ovigerous); 1 ovigerous female with reticulate chelae. Northeast corner, 45 feet, *Pocillopora* coral; August 30,

1958; C. Limbaugh, T. Chess, and A. Hambly: 2 males, 1 ovigerous female, also with reticulate chelae.

MEASUREMENTS. Largest specimen, male: length 15.6 mm., width 18.3 mm. Largest female, ovigerous: length 15.9 mm., width 19.4 mm. Smallest ovigerous female: length 3.0 mm., width 4.0 mm. Young: length 1.7 mm., width 2.4 mm.

HABITAT. The *Pocillopora* coral colony. Sublittoral.

REMARKS. In the absence of a notation to the effect that specimens were collected from coral, or of the inclusion of a piece of coral with the specimens collected, the presence of *Trapezia ferruginea* among an assortment of small Xanthidae was taken as *prima facie* evidence that the sample came from *Pocillopora*. Because it predominates over the related *Trapezia digitalis* by a ratio of 3 to 1 or more, *T. ferruginea* is the better indicator of the two species. Although the number of coral heads is not mentioned, the large number of specimens obtained from several of the diving stations tends to support the writer's observation (Garth, 1946, p. 492) that many more than a single pair of crabs occupy the same coral head. The high proportion of ovigerous females indicates either a seasonal peak in August–September, or continuous breeding.

The writer follows Ortmann (1897a) and Alcock (1898), rather than Rathbun (1907, 1930), in considering *Trapezia ferruginea* specifically distinct from *T. cymodoce* (Herbst).

Family GRAPSIDAE

Grapsus grapsus (Linnaeus).

Cancer grapsus LINNAEUS, 1758, p. 630 (America and Ascension Island).

Grapsus grapsus, IVES, 1891, p. 190. RATHBUN, 1918, p. 227, pls. 53, 54 (Socorro, Clarion, Galápagos). BOONE, 1927, p. 244, fig. 90. SIVERTSEN, 1933, p. 18. CRANE, 1937, p. 77; 1947, p. 83. GARTH, 1946, p. 504, pl. 86, figs. 1, 2; 1948, p. 55 (Malpelo). HOLTHUIS, 1954, p. 36.

RANGE. Lower California and Gulf of California, Mexico, to Chile. Socorro and Clarion islands. Galápagos Islands. Malpelo Island. Occurs also in the Atlantic.

MATERIAL. Clipperton Island: October, 1956; C. Limbaugh: 2 males, 5 females (4 ovigerous). August, 1958; Marie-Hélène Sacht: 2 males, 1 female. Coral reef: August, 1958; E. S. Reese: 3 males, 4 females (2 ovigerous). Camp to U. S. Base counterclockwise: August 8, 1958; C. R. Harbison: 1 male. Northwest end, reef: August 14, 1958; E. S. Reese, W. Baldwin, and J. Wintersteen: 3 males, 2 females, 1 young. South shore, coral reef: August 19, 1958; E. S. Reese, W. Baldwin, and C. Limbaugh: 1 female. Northwest end, high tide-pool: August 24, 1958; E. S. Reese, W. Baldwin, and J. Wintersteen: 1 male, 3 females, 1 carapace. Lagoon shore, NE., above water; September 4, 1958; C. Limbaugh: 1 female, 1 cast. Northeast side, high intertidal; September 4,

1958; C. Limbaugh and T. Chess: 4 males, 1 female, 4 young. Northeast side, splash zone; September 6, 1958; C. Limbaugh: 1 young. Northeast side, high intertidal; September 10, 1958; C. Limbaugh and T. Chess: 20 males, 14 females (3 ovigerous). September 10–15, 1958; C. R. Harbison: 2 males, 2 ovigerous females.

MEASUREMENTS. Largest specimen, male: length 60 mm., width 69 mm. Largest female, ovigerous: length 63 mm., width 79.2 mm.; smallest ovigerous female: length 42.8 mm., width 46.4 mm. Young: length 8.8 mm., width 10.0 mm.

HABITAT. Throughout all rocky intertidal areas. (E. S. Reese) High intertidal. Splash zone. (C. Limbaugh)

REMARKS. Lack of an earlier record of *Grapsus grapsus* from Clipperton Island has at last been rectified. In a letter dated June 7, 1963, Dr. F. A. Chace, Jr., Curator of Marine Invertebrates, U. S. National Museum, informed the writer of a fine female specimen in perfect condition collected by John T. Arundel, presumably while visiting the island in 1897 aboard the *Navarro*. According to Dr. Chace, the specimen even retains traces of the original color pattern. While collectors with limited time may have neglected this common and conspicuous crab in favor of less abundant and therefore more desirable species, it is gratifying now to have some 80 specimens, in good size range, including ovigerous females as well as young, and to be able to report that it is the eastern Pacific–tropical Atlantic species, rather than the Indo-Pacific *G. tenuicrustatus* (Herbst), that occurs on Clipperton Island. With this report, *G. grapsus* is now known to have reached all the tropical outliers of the western American coast.

Geograpsus lividus (Milne Edwards).

Grapsus lividus MILNE EDWARDS, 1837, p. 85 (Antilles).

Geograpsus lividus, STIMPSON, 1860b, p. 230 (Cape San Lucas). RATHBUN, 1902, p. 278 (Clipperton); 1918, p. 232, pl. 55 (Galápagos). BOONE, 1927, p. 251, fig. 91. SIVERTSEN, 1933, p. 19. GARTH, 1946, p. 506, pl. 86, figs. 3, 4; 1957, p. 94, synonymy. HERTLEIN AND EMERSON, 1957, p. 5 (Clipperton).

RANGE. Central Pacific at Hawaii. Eastern Pacific from Lower California to Chile. Galápagos Islands. Clipperton Island. Occurs also in the Atlantic.

MATERIAL. Clipperton Island: December 12, 1954; R. L. Fisher, J. B. Jordan, and S. O'Neil: 1 female (not measured). October, 1956; C. Limbaugh: 7 males, 4 females. August, 1958; Marie-Hélène Sacht: 1 male, 2 females. Coral reef, intertidal; August, 1958; E. S. Reese: 1 male, 1 female. Camp to U. S. Base counterclockwise; August 8, 1958; C. R. Harbison: 1 male. Northwest end, reef; August 14, 1958; E. S. Reese, W. Baldwin, and J. Wintersteen: 1 male, 2 females (1 ovigerous). Northeast corner; August 29, 1958; C. Limbaugh: 1 ovigerous female. Lagoon, E. shore; August 29, 1958; C. Limbaugh:

1 male. Same locality, above water; September 4, 1958; C. Limbaugh: 1 male, 2 females, 1 young. Northeast side, splash zone; September 6, 1958; C. Limbaugh: 1 male, 2 young. Northeast side, high intertidal; September 10, 1958; C. Limbaugh and T. Chess: 2 males. September 10-15, 1958; C. R. Harbison: 3 males, 2 ovigerous females. Northeast side, crest of atoll, near burrows under rocks; September 12, 1958; C. Limbaugh: 1 young.

MEASUREMENTS. Largest specimen, male: length 34.4 mm., width 40.8 mm. Largest female, ovigerous: length 29.0 mm., width 36.4 mm. Smallest ovigerous female, length 14.4 mm., width 18.8 mm. Young: length 5.3 mm., width 6.2 mm.

HABITAT. Intertidal; high intertidal; splash zone. Crest of atoll [an unusual situation; needs confirmation].

REMARKS. The species has been taken at Clipperton Island on two previous occasions: by the Hopkins-Stanford Expedition (Rathbun, 1902) and by the Scripps Expedition of 1954 (Hertlein and Emerson). It is a more secretive species by day than *Grapsus grapsus*, dwelling in crevices above the water line and revealing its presence by the glint of sunlight on the long yellow hairs with which the legs are liberally provided.

Pachygrapsus minutus A. Milne Edwards.

(Figure 14.)

Pachygrapsus minutus A. MILNE EDWARDS, 1873, p. 292, pl. 14, fig. 2 (New Caledonia). CANO, 1889, p. 240 (Hawaii). BOONE, 1934, p. 180, pl. 91 (Samoa). SCHMITT, 1939, p. 22 (Clipperton). HOLTHUIS, 1953, p. 31 (Onotoa). HERTLEIN AND EMERSON, 1957, p. 5 (Clipperton). EDMONDSON, 1959, p. 171, figs. 8c, 9d, 9e (Line Islands). FOREST AND GUINOT, 1961, p. 155, synonymy (Tahiti).
Sesarma murrayi CALMAN, 1909, p. 708, pl. 72, figs. 4, 5 (Christmas Island, Indian Ocean).

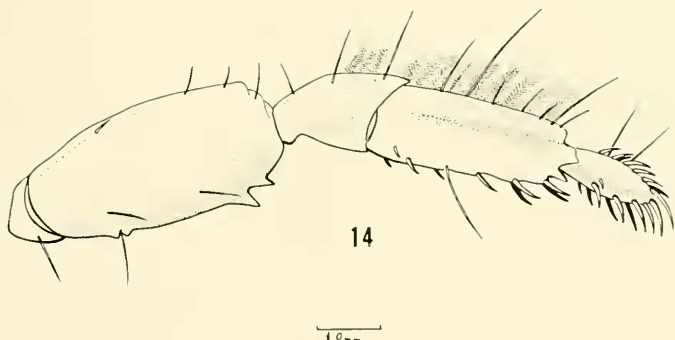


FIGURE 14. *Pachygrapsus minutus* A. Milne Edwards, right fourth walking leg. Drawing by Isolda Wisshaupt.

RANGE. Indo-Pacific from Red Sea and Zanzibar to Hawaii, Line Islands, and Tahiti. Eastern Pacific at Clipperton Island.

MATERIAL. Clipperton Island: December 12, 1954; R. L. Fisher, J. B. Jordan, and S. O'Neil: 1 female, 2 young. October, 1956; C. Limbaugh: 1 male, 2 females, 3 young. August 7-26, 1958; E. S. Reese, W. Baldwin, and J. Wintersteen: 4 males, 3 females. East side, coral reef; August 9, 1958; E. S. Reese, W. Baldwin, and J. Wintersteen: 4 young. Northwest end; August 14, 1958; E. S. Reese, W. Baldwin, and J. Wintersteen: 1 female. East end, coral reef; August 15, 1958; E. S. Reese, W. Baldwin, and J. Wintersteen: 2 females, 22 young. South shore, coral reef; August 19, 1958; E. S. Reese, W. Baldwin, and C. Limbaugh: 1 male. Northwest end, high tidepool; August 24, 1958; E. S. Reese, W. Baldwin, and J. Wintersteen: 5 males, 1 ovigerous female. Northeast end, low intertidal to 6 inches; September 4, 1958; C. Limbaugh and T. Chess: 7 males, 5 females (2 ovigerous), 15 young.

MEASUREMENTS. Largest specimen, male: length 8.6 mm., width 10.8 mm. Largest ovigerous female: length 6.4 mm., width 8.4 mm.; smallest ovigerous female: length 4.2 mm., width 5.6 mm. Young: length 2.0 mm., width 2.6 mm.

HABITAT. High tidepool; low intertidal to 6 inches. Owing to the mingling of this and the following species in collecting, their habitats cannot be differentiated at present.

REMARKS. A preliminary examination of the small grapsids from Clipperton Island disclosed the presence of two species of *Pachygrapsus* among them. Because of formalin preservation and consequent loss of legs, separation using the obvious character of presence or absence of the bituberculate tooth at the proximal end of the merus of the fourth walking leg proved impossible in many cases. Fortunately, the third maxilliped provided a reliable character for separating *P. minutus* from the following *P. planifrons*. Other differences between the two species are listed under *P. planifrons*.

The finding of two small *Pachygrapsus* species at Clipperton where only one, *P. minutus*, had been reported before (Schmitt, 1939; Hertlein and Emerson, 1954) led to a reexamination of specimens from Clarion, Socorro, and Galápagos in Hancock collections previously attributed to *P. transversus* (Gibbes), the ampho-American species. As a result it can be reported that *P. minutus* occurs

FIGURE 15. *Pachygrapsus planifrons* de Man, male, dorsal view. Scale in millimeters.

FIGURE 16. Same, ventral view.

FIGURE 17. *Plagusia depressa tuberculata* Lamarck, female, dorsal view. Scale in millimeters.

FIGURE 18. Same, ventral view.

FIGURE 19. *Percnon abbreviatum* (Dana), male, dorsal view. Scale in millimeters.

FIGURE 20. Same, ventral view.



also at Clarion and Socorro islands, although not, apparently, in the Galápagos Islands. It is felt that this information should be made available at this time, rather than waiting for the Hancock Grapsidae to be monographed.

Pachygrapsus planifrons de Man.

(Figures 15, 16.)

Pachygrapsus planifrons DE MAN, 1888, p. 368, pl. 16, fig. 2 (Noordwachter Island); 1908, p. 218. TESCH, 1918, p. 77 (Lombok). WARD, 1934, p. 25 (Christmas Island). EDMONDSON, 1959, p. 173, figs. 10b, 11a-e (Oahu, Midway, Guam, Line Islands, Canton, Penrhyn, Johnston).

Pachygrapsus longipes RATHBUN, 1893, p. 247; 1906, p. 840, pl. 8, fig. 7 (Hawaii).

RANGE. Indian Ocean, Indonesian seas, and Pacific Ocean east to Hawaii and the Line Islands. Rather common about the equatorial islands of the central Pacific Ocean (Edmondson).

MATERIAL. Clipperton Island: October, 1956; C. Limbaugh: 1 ovigerous female. August 7-26, 1958; E. S. Reese, W. Baldwin, and J. Wintersteen: 1 male, 3 young. East shore, coral reef; August 9, 1958; E. S. Reese, W. Baldwin, and J. Wintersteen: 1 young female, 1 young. Northwest end, reef; August 14, 1958; E. S. Reese, W. Baldwin, and J. Wintersteen: 1 male, 1 ovigerous female. East end; August 15, 1958; E. S. Reese, W. Baldwin, and J. Wintersteen: 1 young. Northwest end; August 24, 1958; E. S. Reese, W. Baldwin, and J. Wintersteen: 6 males, 2 females (1 ovigerous). Northeast side, September 4, 1958; C. Limbaugh, T. Chess, and A. Hambly: 8 males, 3 females (1 ovigerous).

MEASUREMENTS. Largest specimen, male: length 9.0 mm., width 11.4 mm. Largest female (post-ovigerous): length 8.2 mm., width 10.4 mm. Ovigerous females from 4.4×5.8 mm. to 7.9×9.8 mm. Young not measured.

HABITAT. Low intertidal to 6 inches; high tidepool. Because of the fact that specimens of this and the foregoing species were combined in collecting, no differentiation is possible between their habitats.

REMARKS. Were it not for the work of Edmondson (1959), who reported it from a number of central Pacific islands, *Pachygrapsus planifrons* might have remained an obscure Indo-west Pacific species and a most unlikely colonizer of

FIGURE 21. *Plagusia speciosa* Dana, female, dorsal view. Scale in millimeters.

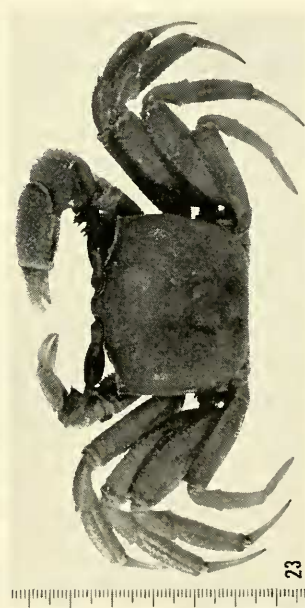
FIGURE 22. Same, ventral view. Scale in millimeters.

FIGURE 23. *Ocyhode ceratophthalma* (Pallas), male, dorsal view. Scale in millimeters.

FIGURE 24. Same, ventral view.

FIGURE 25. *Ocyhode ceratophthalma* (Pallas), female, dorsal view. Scale in millimeters.

FIGURE 26. Same, ventral view.



Clipperton Island. True, it had been reported from Oahu by Rathbun (1893) under the name of *P. longipes*, but it more likely arrived from Johnston Island, or one of the Line Islands, in the same latitude. According to Ward (1934) the distinctive characters are the flat carapace, the sinuous front, the concave lateral margins, and the hairs at the fingertips. *Pachygrapsus planifrons* is now recorded from the eastern Pacific.

***Plagusia depressa tuberculata* Lamarck.**

(Figures 17, 18.)

Plagusia tuberculata LAMARCK, 1818, p. 247 (Ile de France).

Plagusia depressa tuberculata, LAURIE, 1906, p. 430. RATHBUN, 1906, p. 841 (Hawaii); 1918, p. 334, pl. 102. EDMONDSON, 1959, p. 190, fig. 22a.

Plagusia orientalis STIMPSON, 1858b, p. 103 (Hong Kong and Hawaii); 1860b, p. 231 (Cape San Lucas).

RANGE. Indo-Pacific from Arabian Sea to Hawaii. Eastern Pacific at Cape San Lucas.

MATERIAL. Clipperton Island: Coral reef; August, 1958; E. S. Reese: 2 young females. East end; August 15, 1958; E. S. Reese, W. Baldwin, and J. Wintersteen: 1 young female, 2 young. Northeast side; September 4, 1958; C. Limbaugh, T. Chess, and A. Hambly: 10 males, 8 females.

MEASUREMENTS. Largest specimen, male: length 16.8 mm., width 18.0 mm. Young: length 5.2 mm., width 5.3 mm.

HABITAT. Low intertidal to 6 inches. The species is pelagic and is transported on floating logs.

REMARKS. The commonly encountered species for this part of the world is *Plagusia immaculata* Lamarck (cf. Garth, 1957, p. 102), of which the Hancock collections contain specimens from Cocos Island, Costa Rica. *Plagusia depressa tuberculata* has been recorded only once before from the eastern Pacific, at Cape San Lucas, Lower California, where it was obtained by John Xantus (Stimpson, 1860b). It may now be said to have been reported from two insular localities in the eastern tropical Pacific, Cape San Lucas being no less an island for warm-water species than Clipperton, since it is cut off from the mainland by cold water to the north (cf. Garth, 1960, p. 118 ff.). Most of the specimens examined are young or adolescent. The species grows to at least 52 × 55 mm.

***Plagusia speciosa* Dana.**

(Figures 21, 22.)

Plagusia speciosa DANA, 1851, p. 252; 1852, p. 369; 1855, Atlas, pl. 23, fig. 9 (Waterland Island, Tuamotu). KINGSLEY, 1880, p. 223 (Tahiti). BORRADAILE, 1900, p. 591 (Funafuti, Ellice Islands; Rotuma, Fiji Islands). BOONE, 1934, p. 185, pls. 95, 96 (Tahiti). HOLT-HUIS, 1953, p. 34 (Ailuk, Marshall Islands). EDMONDSON, 1959, p. 193, fig. 22c (Guam and Washington Island). FOREST AND GUINOT, 1961, p. 162, figs. 177a-c, 178 (male pleopods figured).

RANGE. Western Pacific from Guam and Fiji to Washington and Tuamotu islands.

MATERIAL. Clipperton Island: West side, on beach; September 21, 1958; C. Limbaugh: 1 female.

MEASUREMENTS. Female: length 25.1 mm., width 27.2 mm.

HABITAT. Pelagic; on floating logs.

REMARKS. Although preserved in alcohol for nearly six years, the single female specimen shows well the color pattern described by Boone (1934, p. 185): "a creamy ground color with a large crimson shield on the gastric-cardiac region, two large crimson spots on each side, one on the hepatic region and the other on the outer lateral margin." The ambulatory legs, while bicolored, are not conspicuously banded as in the *Alva* specimen.

The occurrence of this rare and handsomely sculptured species at Clipperton is remarkable in view of its apparent restriction to a mid-Pacific parallelogram having Guam, Fiji, Washington, and Tuamotu islands at its four corners. According to Edmondson (1959, p. 193) it has not yet been recorded from Hawaii. Its specific distinctiveness from other *Plagusia* species is supported by figures of the first and second pleopods of a male from Tuamotu (Forest and Guinot, 1961, figs. 177, 178). A dried carapace from Waterland Island, Paumotu Islands (an older name for Tuamotu), in the collections of the U. S. National Museum is one of the very few Dana types still extant, according to Dr. F. A. Chace, Jr.

Percnon abbreviatum (Dana).

(Figures 19, 20.)

Acanthopus abbreviatus DANA, 1851, p. 252; 1852, p. 373; 1855, Atlas, pl. 23, fig. 11 (Tahiti).

Percnon abbreviatum, RATHBUN, 1906, p. 842 (Hawaii). SCHMITT, 1939, p. 22 (Clipperton). EDMONDSON, 1959, p. 195, figs. 25b, 26a-c (Line Islands, Wake Island, American Samoa).

RANGE. Indian Ocean [?], Tahiti, Hawaii, Fanning, Ocean, and Wake islands (*vide* Schmitt). Clipperton Island.

MATERIAL. Clipperton Island: 1958: 1 male. Northwest end, reef; August 14, 1958; E. S. Reese, W. Baldwin, and J. Wintersteen: 3 young. East side, coral reef; August 15, 1958; E. S. Reese, W. Baldwin, and J. Wintersteen: 5 females (1 ovigerous). Northeast side, 45 feet, *Pocillopora* coral; August 28, 1958; C. Limbaugh, T. Chess, and A. Hambly: 2 males. Northeast corner, 45 feet, *Pocillopora* coral; August 30, 1958; C. Limbaugh, T. Chess, and A. Hambly: 1 ovigerous female, 1 young. Northeast side, reef flat, 0-1 foot; September 13, 1958; C. Limbaugh, T. Chess, and A. Hambly: 12 males, 8 females (6 ovigerous), 1 young; collected with "Endrin." East side, reef flat margin or ridge, 0-2 feet; September 14, 1958; C. Limbaugh and T. Chess: 1 female, 1 young.

MEASUREMENTS. Largest specimen, ovigerous female: length 14.9 mm., width 15.1 mm. Largest male: length 14.4 mm., width 14.8 mm. Smallest ovigerous female: length 12.7 mm., width 12.5 mm. Young: length 5.9 mm., width 5.4 mm.

HABITAT. Reef flat margin or ridge, 0–2 feet. Specimens obtained from coral at a depth of 45 feet included an ovigerous female, as well as young.

REMARKS. First reported from the eastern Pacific by Schmitt (1939), *Percnon abbreviatum* is known from a number of central Pacific localities. According to Edmondson (1959, p. 199), earlier records of its occurrence in the western Pacific and Indian oceans are unreliable because of possible confusion with *P. demani* Ward (1934, p. 24). Clipperton Island specimens have been compared with specimens of *P. abbreviatum* from Bikini, Marshall Islands, and from the Ryukyu Islands, and with specimens of *P. demani* from Ulithi, Caroline Islands, in the collections of the Hancock Foundation. A key to the species of *Percnon* is given by Schmitt (1939, p. 23).

***Percnon gibbesi* (Milne Edwards).**

Acanthopus gibbesi MILNE EDWARDS, 1853, pp. 146, 180 (Antilles).

Percnon gibbesi, RATHBUN, 1918, p. 337, pl. 105; 1919, p. 25. HULT, 1938, p. 14 (Galápagos).

SCHMITT, 1939, p. 25. GARTH, 1946, p. 512, pl. 86, figs. 5, 6; 1948, p. 57; 1957, p. 104.

RANGE. Cape San Lucas, Mexico, to Chile (?). Galápagos Islands. Occurs also in the Atlantic Ocean.

MATERIAL. Clipperton Island: October, 1956; C. Limbaugh: 1 young. Coral reef; August, 1958; E. S. Reese: 2 males. South shore, coral reef; August 11, 1958; E. S. Reese, C. Limbaugh, and J. Wintersteen: 3 males, 1 young. East end, coral reef; August 15, 1958; E. S. Reese, W. Baldwin, and J. Wintersteen: 3 males, 3 females, 18 young. South shore; August 19, 1958; E. S. Reese, W. Baldwin, and C. Limbaugh: 1 male, 1 female, 1 young. Northeast corner, August 29, 1958; C. Limbaugh: 1 young male. Northeast side, low intertidal to 6 inches; September 4, 1958; C. Limbaugh, T. Chess, and A. Hambly: 11 young. Northeast side, reef flat, 0–1 foot; September 13, 1958; C. Limbaugh, T. Chess, and A. Hambly: 37 males, 27 females (20 ovigerous), 2 young; collected with "Endrin."

MEASUREMENTS. Largest specimen, ovigerous female: length 24.2 mm., width 22.5 mm. Largest male: length 22.2 mm., width 20.4 mm. Smallest ovigerous female: length 16.8 mm., width 15.3 mm. Young: length 6.0 mm., width 5.2 mm.

HABITAT. Reef flat; low intertidal to 1 foot. Unlike the preceding species, *Percnon gibbesi* was not collected in *Pocillopora* coral, nor from a depth of 45 feet.

REMARKS. Although not previously reported from Clipperton Island, *Percnon gibbesi* is the common species there, predominating over the earlier reported

P. abbreviatum by three or four to one. Since in the Hawaiian Islands (Edmondson, 1959, p. 197) and elsewhere in the central Pacific a similar position of dominance over *P. abbreviatum* is occupied by *P. planissimum* (Herbst), it was at first thought that the second species of the genus at Clipperton Island would prove to be of Indo-Pacific origin also. However, comparison of Clipperton Island specimens with specimens of *P. planissimum* from the Marshall Islands leaves no doubt that it is the amphi-American form that is found at Clipperton, as also in the Galápagos Islands. Whether these should be considered as full species, as advocated by Rathbun (1918, p. 338), or as subspecies of a single circumtropical species, as advocated by Balss (1922, p. 6), should not be settled on the basis of Clipperton Island specimens alone, but rather on a reappraisal of the relationships between the several regional populations, including the West African (Monod, 1956, p. 454). Sufficient for present purposes is the fact that Clipperton Island specimens are clearly separable from Marshall Islands specimens, and by those very characters given by Schmitt (1939, p. 25), but earlier enunciated by Rathbun (1919, p. 25), for separating *P. gibbesi* from *P. planissimum*.

Family GECARCINIDAE

Gecarcinus planatus Stimpson.

Gecarcinus planatus STIMPSON, 1860b, p. 234 (Cape San Lucas). RATHBUN, 1918, p. 359, pls. 123, 124, text-fig. 163 (Revilla Gigedo, Clipperton). SCHMITT, 1939, p. 24. HERTLEIN AND EMERSON, 1957, p. 5. GARTH, 1948, p. 59.

Gecarcinus malpiliensis FAXON, 1893, p. 157; 1895, p. 28, pl. 4, figs. 2-2b (Malpelo).

Gecarcoidea lalandei, LENZ, 1901, p. 473 (Clipperton). (Not *G. lalandii* Milne Edwards, 1837).

RANGE. Lower California to Acapulco, Mexico. Revilla Gigedo Islands; Clipperton Island; Malpelo Island, Colombia.

MATERIAL. Clipperton Island: December 12, 1954: R. L. Fisher, J. B. Jordan, and S. O'Neil: 2 males, 2 females (1 young). October, 1956: C. Limbaugh: 2 males, 3 young females. August, 1958: Marie-Hélène Sacht: 4 males, 8 females. Camp to U. S. Base counterclockwise; August 8, 1958: C. R. Harbison: 2 males, 1 female. Same locality and collector; August 9, 1958: 1 male. Northeast top of atoll, 7-10 feet above sea level; September 4, 1958: C. Limbaugh: 2 males, 4 females (1 ovigerous), 2 young. Northeast side, lagoon shore, above water; September 4, 1958; C. Limbaugh: 1 male, 2 females. September 10-15, 1958; C. R. Harbison: 1 male, 1 female. Crest of atoll, north-east side; September 12, 1958; C. Limbaugh: 17 males, 3 females.

MEASUREMENTS. Largest specimen, male: length 60.2 mm., width 78.3 mm. Largest female: length 47 mm., width 60.2 mm. Ovigerous female: length 34.6 mm., width 42.7 mm. Young: length 4.2 mm., width 4.6 mm.

HABITAT. Primarily nocturnal; live in burrows under rocks; feed on rotten animals and coconut. (Limbaugh)

REMARKS. Apparently the first mention of the land crab of Clipperton Island in carcinological literature was by Lenz (1901), who wrote concerning the collections gathered by Prof. Schauinsland: "Von dieser ansehnlichen Landkrabbe sind 5 Exemplare (4 ♂♂, 1 ♀) vorhanden. Dieselben fanden sich in lebendem Zustande im Guano, der von Clipperton Island (109° w. L. 10° n. Br.) nach Honolulu gebracht worden war." Lenz attributed them to *Gecarcoidea lalandii* Milne Edwards, a species reported from Brazil but which probably inhabits only Indo-Pacific islands, according to Rathbun (1918).

Writing of them in 1939, Schmitt reports: "In former years this species was exceedingly abundant on Clipperton. It is possible that the drove of wild pigs loose on the island has so reduced their numbers that they now seem scarce." In view of the situation at that time, the following observations of Marie-Hélène Sachet, expedition botanist (personal communication), are pertinent:

"Many papers on Clipperton Island mention the extraordinary abundance of land crabs on the atoll (cf. Sachet, 1960, for a brief discussion and bibliography). The first person to report their remarkable decrease was Dr. Waldo Schmitt (1939). It is not easy for me to evaluate from Dr. Schmitt's paper whether they were more abundant in 1938 than 1958, or less, as time of day, insolation, etc., would have influenced his observations, which were, of necessity, very brief. I would say that in 1958 the crabs were common, but not abundant. Anyone wanting to make a large sampling of the population could have done so with little trouble, but they were not crawling all over the island as they did 50 years ago, and they were absolutely no problem in camp. . . . The crabs appeared to live in natural holes under overhanging ledges of phosphatic rock, or in holes they dug in the soft phosphatic silt under the protection of stones, boulders, or even pebbles lying below the vegetation cover. I never saw what they ate. Many pigs were killed and were swiftly disposed of with the help of flies and other organisms, but I did not see crabs near the carcasses. I suspect, but did not observe, that they may kill nestling birds if they are weakened, and that they probably eat much plant material.

"On a hot sunny day, they were not in evidence, although if the edge of their shelter cast a little shade, they could be seen peering out from under it. On a cool, overcast day, they would be scrambling about and in the late afternoon, they came out. I definitely saw them go to the lagoon about 5 or 6 p.m. and let themselves fall from small cliffs and rocks into the water. I also saw them scrambling back from the ocean across the beaches and beach ridges. I had no chance to check whether only the egg-bearing females, or all females, or males and females, did this.

"The pigs ate great quantities of them, as evidenced by some of their droppings, which seemed to be entirely made up of crab carapaces. How they caught the crabs I did not observe, as the pigs were very shy and could not be easily approached."

In a letter dated May 15, 1962, Dr. F. A. Chace, Jr., Curator of Marine Invertebrates, U. S. National Museum, wrote: "A female of what I assume to be *Gecarcinus planatus*, labeled 'Clipperton Isl.—John T. Arundel' has just come to my attention. This specimen was apparently inadvertently extracted from the California Academy when the *Albatross* material was retrieved from that institution in 1948. It was probably part of the collection made by Arundel when he visited Clipperton on the *Navarro* in 1897. According to Miss Sachet (1960), 'Ces collections sont importantes car elles sont les premières à avoir été décrites dans la littérature scientifique de l'île (Wharton, Teall, Garman).'" Thus, after more than half a century, what was possibly the first crab to have been collected at Clipperton now becomes a matter of record, along with the most recent crabs known to have been collected there.

Family OCYPODIDAE

Ocypode ceratophthalma (Pallas).

(Figures 23–26.)

Cancer ceratophthalmus PALLAS, 1772, p. 83, pl. 5, fig. 17.

Ocypode ceratophthalma FABRICIUS, 1798, p. 347. ORTMANN, 1897b, p. 364 (synonymy).

RATHBUN, 1906, p. 833 (Hawaii). STIMPSON, 1907, p. 108, pl. 12, fig. 2 (Hawaii, Tahiti).

HOLTHUIS, 1953, p. 29 (Tuamotu).

RANGE. Distributed throughout the entire Indo-Pacific region. From Red Sea, Port Elizabeth, and Madagascar to Tokyo, New South Wales, Tahiti, Fanning and Hawaiian islands. (Ortmann)

MATERIAL. Clipperton Island: October, 1956; C. Limbaugh: 1 male, 1 female.

MEASUREMENTS. Largest specimen, male, length 40.2 mm., width 43.7 mm. Female, length 38.2 mm., width 43.8 mm.

HABITAT. On sandy beaches in deep burrows, near or above high tide.

REMARKS. In view of the circumtropical distribution of *Ocypode*, the presence of a member of the genus at Clipperton might have been anticipated. However, it was not until specimens of Conrad Limbaugh's 1956 collecting became available that it could be determined whether it would be the eastern Pacific *O. gaudichaudii* Milne Edwards and Lucas, found at Cocos and Galápagos and along the Central and South American mainland from El Salvador to Chile, or the western Pacific *O. ceratophthalma*. Comparison of the above specimens with a pair of the latter from Eniwetok Atoll in the Marshall Islands left no doubt of their identity with the Indo-west Pacific species, for while both species have the eyestalks prolonged beyond the cornea, the fingers of *O. ceratophthalma* are pointed, those of *O. gaudichaudii* truncate. The random nature of insular dispersal is again illustrated, with chance in this instance favoring the establishment of the western rather than the eastern Pacific species.

DISTRIBUTION

Clipperton Island shares with Clarion Island to the northwest and the Galápagos Islands to the southeast the role of outlier to the American continent, and with them forms a line roughly parallel to the Mexican–Central American axis at a distance of about 600 nautical miles. Clipperton is more isolated than the others, however, for between Clarion and the mainland lie Socorro and San Benedicto, between Galápagos and the mainland lie Cocos and Malpelo, while between Clipperton and the mainland there is only the unbroken ocean. To the west of Clarion the nearest land is the Hawaiian Islands; to the west of the Galápagos are the Marquesas; while west of Clipperton itself are the Line Islands (Palmyra, Washington, Fanning, and Christmas), which trend in the same NW.–SE. direction as their American counterparts. Between these outliers of Polynesia and the American outliers stretches nearly 2,000 miles of unbroken ocean, the Central Pacific Oceanic Barrier, constituting a most formidable obstacle to the migration of terrestrial and shore-bound marine animals.

It is of considerable interest, therefore, to find that nearly one-half (16 of 34) of the brachyuran crab species inhabiting Clipperton Island are of Indo-Pacific origin, and that of these over half (9 of 16) have not yet reached the American mainland. Remarkable also is the fact that of the same nine species, eight have not been recorded from one or more of the other outliers of the American continent, the sole exception being *Pachygrapsus minutus*, recorded herein as occurring at Clarion and Socorro islands as well. Since these other islands appear equally well situated to receive such immigrants and present more extensive coastlines suitable for their establishment, it must be concluded that Clipperton is more favorably located with respect to routes of dispersal eastward from the central Pacific, or that its uniqueness as a coral atoll gives it an advantage over them in assuring the survival of current-borne species.

ENDEMISM

While, with the synonymizing of *Thalamita roosevelti* Schmitt with *T. picta* Stimpson, there remains no Clipperton Island brachyuran endemic species, evidence of incipient speciation persists in the Xanthidae, where both *Actaca sulcata* Stimpson and *Micropanope xantusii* (Stimpson) exhibit minor but consistent differences from their mainland counterparts. Moreover, two minute specimens recovered by diving in 78 feet, the one belonging to *Actaca*, the other to *Micropanope*, cannot with certainty be identified with known eastern Pacific representatives of these genera. Pending recovery of adult specimens of these, or discovery of additional species, it may be concluded that endemism among brachyurans at Clipperton is weakly expressed, and does not manifest itself above the populational level.

FAUNAL BOUNDARIES

Should the proportion of western Pacific to eastern Pacific species found at Clipperton Island reach or surpass the 50 per cent mark that it now approaches, consideration might be given to relocating the boundary between the faunas so that it passes between Clipperton Island and the American mainland.

LITERATURE CITED

ALCOCK, A.

1898. Materials for a carcinological fauna of India. No. 3. The Brachyura Cyclometopa. Part I. The family Xanthidae. *Journal of the Asiatic Society of Bengal*, vol. 67, pp. 67-233.

BALSS, H.

1922. Crustacea VII: Decapoda Brachyura (Oxyrhyncha bis [und] Brachyrhyncha) und geographische Uebersicht über Crustacea Decapoda. *In: W. Michaelsen, Beiträge zur Kenntniss der Meeresfauna Westafrikas, III, Lief. 3*, pp. 69-110, 1 fig. Hamburg, 1922.

BOONE, LEE

1927. The littoral crustacean fauna of the Galapagos Islands. *Zoologica*, vol. 8, no. 4, pp. 127-288.
1934. Scientific results of the world cruise of the yacht "Alva," 1931, William K. Vanderbilt, commanding. Crustacea: Stomatopoda and Brachyura. *Bulletin of the Vanderbilt Marine Museum*, vol. 5, pp. 1-210.

BORRADAILE, L. A.

1900. On some Crustaceans from the South Pacific. Part IV. The Crabs. *Proceedings of the Zoological Society of London*, 1900, pp. 568-596.
1902. Marine Crustaceans. I. On Varieties. II. Portunidae. *In: J. Stanley Gardiner, The fauna and geography of the Maldive and Laccadive archipelagoes*, vol. 1, pt. 2, pp. 191-208.

BUITENDIJK, ALIDA M.

1950. Note on a collection of Decapoda Brachyura from the coasts of Mexico, including the description of a new genus and species. *Zoologische Mededelingen uitgegeven door het Rijksmuseum van Natuurlijke Historie te Leiden*, vol. 30, no. 17, pp. 269-282.
1960. Biological results of the Snellius Expedition. XXI. Brachyura of the families Ateleyclidae and Xanthidae (Part I). *Temminckia*, vol. 10, pp. 252-338.

CALMAN, W. T.

1909. On decapod Crustacea from Christmas Island, collected by Dr. C. W. Andrews. F.R.S., F.Z.S. *Proceedings of the Zoological Society of London*, 1909, pp. 703-713.

CANO, G.

1889. Viaggio della R. Corvetta Vettor Pisani attorno al globo. Crostacei Brachiuri ed Anomuri. *Bollettino della Società di Naturalisti in Napoli*, ser. 1, vol. 3, pp. 169-268.

CHACE, F. A., JR.

1962. The non-brachyuran decapod crustaceans of Clipperton Island. *Proceedings of the United States National Museum*, vol. 113, pp. 605-635.

CRANE, JOCELYN

1937. The Templeton Crocker Expedition. III. Brachygnathous crabs from the Gulf of California and the west coast of Lower California. *Zoologica*, vol. 22, no. 3, pp. 47-78.
1947. Eastern Pacific expeditions of the New York Zoological Society. XXXVII. Intertidal brachygnathous crabs from the west coast of tropical America with special reference to ecology. *Zoologica*, vol. 32, pt. 2, pp. 69-95.

DANA, J. D.

1851. *Conspectus Crustaceorum quae in orbis terrarum circumnavigatione, Carolo Wilkes e classe Reipublicae Foederatae duce, lexit et descripsit.* Proceedings of the Academy of Natural Sciences of Philadelphia, vol. 5, pp. 247-274.
1852. United States Exploring Expedition during the years 1838, 1839, 1840, 1841, 1842, under the command of Charles Wilkes, U.S.N. Vol. 13, Crustacea, pt. 1, pp. (viii) 1-685.
1855. [Same Title.] Vol. 13, Crustacea, Atlas, pp. 1-27, pls. 1-96.

DURHAM, J. W., and J. L. BARNARD

1952. Stony corals of the eastern Pacific collected by the *Velero III* and *Velero IV*. Allan Hancock Pacific Expeditions, vol. 16, no. 1, pp. 1-110.

EDMONDSON, C. H.

1923. Crustacea from Palmyra and Fanning Islands, with descriptions of new species of crabs from Palmyra Island by Mary J. Rathbun. *Bernice P. Bishop Museum Bulletin*, no. 5, pp. 1-43.
1925. Marine zoology of tropical central Pacific. Crustacea. *Bernice P. Bishop Museum Bulletin*, no. 27, pp. 1-62.
1959. Hawaiian Grapsidae. *Occasional Papers of Bernice P. Bishop Museum, Honolulu, Hawaii*, vol. 22, no. 10, pp. 153-202.
1962. Xanthidae of Hawaii. *Occasional Papers of Bernice P. Bishop Museum*, vol. 22, no. 13, pp. 215-309.

EYDOUX, J. F. T., and L. F. A. SOULEYET

- 1842 (or 1843). Voyage autour du monde exécuté pendant . . . 1836 et 1837 sur . . . La Bonite, commandée par M. Vaillant, etc. Atlas, pls. 1-101. Paris.
- 1844 (or 1845). [Same Title.] *Zoologie*, vol. 1, Crustacés, pp. 219-272. Paris.

FABRICIUS, J. C.

1798. *Supplementum entomologiae systematicae. Hafniae*, pp. 1-572.

FAXON, W.

1893. Reports on the dredging operations off the west coast of Central America to the Galapagos, to the west coast of Mexico, and in the Gulf of California . . . by the U. S. Fish Commission steamer "Albatross," during 1891 . . . VI. Preliminary descriptions of new species of Crustacea. *Bulletin of the Museum of Comparative Zoölogy at Harvard College*, vol. 24, pp. 149-220.
1895. Reports on an exploration off the west coasts of Mexico, Central and South America, and off the Galapagos Islands . . . by the U. S. Fish Commission steamer "Albatross," during 1891 . . . XV. The stalk-eyed Crustacea. *Memoirs of the Museum of Comparative Zoölogy at Harvard College*, vol. 18, pp. 1-292.

FINNEGAN, SUSAN

1931. Report on the Brachyura collected in Central America, the Gorgona and Galapagos Islands, by Dr. Crossland on the 'St. George' Expedition to the Pacific, 1924-25. *Journal of the Linnaean Society of London, Zoology*, vol. 37, pp. 607-673.

FIZE, A., and R. SERÈNE

1957. Les Hapalocarcinidés du Viêt-Nam. Mémoires de L'Institut Océanographique de Nhatrang, no. 10, pp. 1-202.

FOREST, J., and DANIELÉ GUINOT

1961. Crustacés Décapodes Brachyours de Tahiti et des Tuamotu. Expédition française sur les récifs coralliens de la Nouvelle-Calédonie. Volume préliminaire. Pp. 1-195. Paris.

FORSKÅL, P.

1775. Descriptiones animalium avium, amphibiorum, piscium, insectorum, vermium; quae in itinere Orientali observavit P. Forskål . . . post mortem auctoris edidit C. Niebuhr. Adjuncta est materia medica Kahirina atque tabula Maris Rubri geographica. 164 pp., 1 map. Hauniae. [Not seen.]

GARTH, J. S.

1946. Littoral brachyuran fauna of the Galapagos Archipelago. Allan Hancock Pacific Expeditions, vol. 5, no. 10, pp. (iv) 341-601.
1948. The Brachyura of the "Askey" Expedition with remarks on carcinological collecting in the Panama Bight. Bulletin of the American Museum of Natural History, vol. 92, art. 1, pp. 1-66.
1957. Reports of the Lund University Chile Expedition 1948-49. No. 29. The Crustacea Decapoda Brachyura of Chile. Lunds Universitets Årsskrift, n. f., Avd. 2, Bd. 53, Nr. 7, pp. 1-128.
1958. Brachyura of the Pacific Coast of America. Oxyrhyncha. Allan Hancock Pacific Expeditions, vol. 21, pp. (xii) 1-854.
- 1960 [1961]. Distribution and affinities of the brachyuran Crustacea. Baja California Symposium. Systematic Zoology, vol. 9, no. 3, pp. 105-123.

HAAN, W. DE

- 1833-1850. *In*: P. F. von Siebold, Fauna Japonica, Crustacea, pp. (xvi) (xxxi) 1-244. Lugduni Batavorum.

HERTLEIN, L. G., and W. K. EMERSON

1957. Additional notes on the invertebrate fauna of Clipperton Island. American Museum Novitates, no. 1859, pp. 1-9.

HOLTHUIS, L. B.

1953. Enumeration of the decapod and stomatopod Crustacea from Pacific coral islands. Atoll Research Bulletin, no. 24, pp. 1-66.
1954. On a collection of decapod Crustacea from the republic of El Salvador (Central America). Zoologische Verhandlungen, Leiden, no. 23, pp. 1-43.

HULT, JÖRAN

1938. Crustacea Decapoda from the Galapagos Islands collected by Mr. Rolf Blomberg. Arkiv för Zoologi, Bd. 30A, no. 5, pp. 1-18.

IVES, J. E.

1891. Crustacea from the northern coast of Yucatan, the harbor of Vera Cruz, the west coast of Florida, and the Bermuda Islands. Proceedings of the Academy of Natural Sciences of Philadelphia, vol. 43, pp. 176-207.

KINGSLEY, J. S.

1880. Carcinological Notes, No. IV. Synopsis of the Grapsidae. Proceedings of the Academy of Natural Sciences of Philadelphia, vol. 32, pp. 187-224.

LAMARCK, J. B. P. A. DE M. DE

1818. Histoire naturelle des animaux sans vertèbres. Ed. 1, vol. 5, pp. 1-612. Paris.

LATREILLE, P. A.

1825. Trapezie. Encyclopédie méthodique: Entomologie, ou Histoire naturelle des Crustacés, des Arachnides et des Insectes, vol. 10, pp. 695-696.

LAURIE, R. D.

1906. Report on the Brachyura. Ceylon Pearl Oyster Fisheries, vol. 5, pp. 249-432. [Not seen.]

LENZ, H.

1901. Ergebnisse einer Reise nach dem Pacific (Schauinsland 1896-1897). Crustaceen. Zoologische Jahrbücher, Abtheilung für Systematik, vol. 14, pp. 429-482.

LINNAEUS, C.

1758. Systema naturae. Ed. 10, vol. 1, pp. 1-823. Holmiae.
1764. Museum Ludovicae Ulricaе. Pp. 1-720. Holmiae.
1766. Systema naturae. Ed. 12, vol. 1, pt. 2, pp. 533-1327. Holmiae.

MAN, J. G. DE

1888. Berichte über die von Herrn Dr. J. Brock im indischen Archipel gesammelten Decapoden und Stomatopoden. Archiv für Naturgeschichte, vol. 53, pt. 1, pp. 215-600.
1902. Die von Herrn Professor Kükenthal im indischen Archipel gesammelten Decapoden und Stomatopoden. In: Kükenthal, W., Ergebnisse einer zoologischen Forschungsreise in den Molukken und Borneo. Abhandlungen von der Senckenbergischen naturforschenden Gesellschaft, vol. 25, pp. 467-929.
1908. The fauna of brackish ponds at Port Canning, Lower Bengal. Records of the Indian Museum, vol. 2, pp. 211-231.

MIERS, E. J.

1877. Account of the zoological collection made during the visit of H.M.S. 'Peterel' to the Galapagos Islands. V. Crustacea. Proceedings of the Zoological Society of London, 1877, pp. 73-75.
1880. On a collection of Crustacea from the Malaysian Region. Part I. Crustacea Oxyrhyncha and Cyclometopa, except Telpusidea. Annals and Magazine of Natural History, ser. 5, vol. 5, pp. 226-239.
1886. Report on the Brachyura collected by H.M.S. Challenger during the years 1873-1876. Report on the scientific results of the Exploring Voyage of H.M.S. Challenger, Zoology, vol. 17, pp. (1) 1-362.

MILNE EDWARDS, A.

1873. Recherches sur la faune carcinologique de la Nouvelle-Calédonie. II. Cyclometopes. Nouvelles Archives du Muséum d'Histoire Naturelle de Paris, vol. 9, pp. 155-332.

MILNE EDWARDS, H.

1837. Histoire naturelle des Crustacés. Vol. 2, pp. 1-532. Paris.
1853. Mémoire sur la famille des Ocypodiens. Annales des Sciences Naturelles, ser. 3, Zoologie, vol. 20, pp. 163-228.

MONOD, T.

1956. Hippidea et Brachyura ouest-africains. Mémoires de l'Institut Français d'Afrique Noire, no. 45, pp. 1-674, text figs. 1-884.

NOBILI, G.

1907. Ricerche sui Crostacei della Polinesia. Memorie Accademia delle Scienze Torino, ser. 2, vol. 57, pp. 351-430.

ORTMANN, A. E.

- 1897a. Die geographische Verbreitung der Decapoden-Familie Trapeziidae. *Zoologische Jahrbücher, Abtheilung für Systematik*, vol. 10, pp. 201-216.
- 1897b. Carcinologische Studien. Revision der Gattung *Ocypoda*. *Zoologische Jahrbücher, Abtheilung für Systematik*, vol. 10, pp. 359-372.

OWEN, R.

1839. Crustacea. *Zoology of Beechey's Voyage*. Pp. 77-92.

PALLAS, P. S.

- 1767-1780. *Spicilegium quibus novae imprimis et obscurae animalium species iconibus, descriptionibus atque commentariis illustrantur*, cura P. S. Pallas . . . Berolini, Gottl. August Lange, 1767-80. 2 vols.

RATHBUN, MARY J.

1893. Scientific results of explorations by the U. S. Fish Commission steamer Albatross. XXIV. Descriptions of new genera and species of crabs from the west coast of North America and the Sandwich Islands. *Proceedings of the United States National Museum*, vol. 16, pp. 223-260.
1898. The Brachyura collected by the U. S. Fish Commission steamer Albatross on the voyage from Norfolk, Virginia, to San Francisco, California, 1887-1888. *Proceedings of the United States National Museum*, vol. 21, pp. 567-616.
1902. Papers from the Hopkins-Stanford Galapagos Expedition, 1898-1899. VIII. Brachyura and Macrura. *Proceedings of the Washington Academy of Sciences*, vol. 4, pp. 275-292.
1906. The Brachyura and Macrura of the Hawaiian Islands. *Bulletin of the United States Fish Commission*, vol. 23 (for 1903), pp. 829-930.
1907. Reports on the scientific results of the expedition to the tropical Pacific . . . by the U. S. Fish Commission steamer "Albatross," from August, 1899, to March, 1900. . . IX. Reports on the scientific results of the expedition to the eastern tropical Pacific . . . by the U. S. Fish Commission steamer "Albatross," from October, 1904, to March, 1905. . . X. The Brachyura. *Memoirs of the Museum of Comparative Zoology at Harvard College*, vol. 35, no. 2, pp. 23-74.
1910. The stalk-eyed Crustacea of Peru and the adjacent coast. *Proceedings of the United States National Museum*, vol. 38, pp. 531-620.
1918. The grapsoid crabs of America. *United States National Museum, Bulletin* no. 97, pp. (xxii) 1-461.
- 1919 [1920]. Stalk-eyed crustaceans of the Dutch West Indies. *In: J. Boeke, Rapport betreffende een voorloopig onderzoek naar den toestand van de Visscherij en de Industrie van Zeeproducten in de Kolonie Curacao. [Report on the fisheries and aquatic resources of the Dutch West Indies (Curacao)]. Part 2, pp. 317-349, text figs. 1-5. Gravenhage, "1919" 1920.*
1930. The cancroid crabs of America of the families Euryalidae, Portunidae, Atecyclidae, Cancridae, and Xanthidae. *United States National Museum Bulletin*, no. 152, pp. (xvi) 1-609.
1937. The oxystomatous and allied crabs of America. *United States National Museum Bulletin*, no. 166, pp. (vi) 1-278.

RÜPPELL, E.

1830. Beschreibung und Abbildung von 24 Arten kurzschwänziger Krabben, als Beitrag zur Naturgeschichte des Rothen Meeres. Pp. 1-28. Frankfurt am Main. [Not seen.]

SACHET, MARIE-HÉLÈNE

1960. Histoire de l'Île Clipperton. Cahiers du Pacifique, No. 2, pp. 3-32.

1962. Monographie physique et biologique de l'Île Clipperton. Annales de l'Institut Océanographique, vol. 40, pp. 1-108.

SAKAI, T.

1939. Studies on the crabs of Japan. IV. Brachygnatha, Brachyrhyncha. Pp. 365-731. Tokyo.

SCHMITT, W. L.

1933. Crustacea. In: Banning, G. H., Hancock Expedition of 1933 to the Galapagos Islands. General Report. Bulletin of the Zoological Society of San Diego, no. 10, pp. 21-26.

1936. Hancock Pacific Expedition, 1935. Explorations and field-work of the Smithsonian Institution in 1935. Pp. 29-36.

1939. Decapod and other Crustacea collected by the Presidential Cruise of 1938 (with introduction and station data). Smithsonian Miscellaneous Collections, vol. 98, no. 6, pp. 1-28.

SIVERTSEN, E.

1933. The Norwegian Zoological Expedition to the Galapagos Islands 1925, conducted by Alf Wollebaek. VII. Littoral Crustacea Decapoda from the Galapagos Islands. Meddelelser fra det Zoologiske Museum, Oslo, no. 38, pp. 1-23.

SLEVIN, J. R.

1931. Log of the schooner "Academy" on a voyage of scientific research to the Galapagos Islands, 1905-1906. California Academy of Sciences Occasional Papers, no. 17, pp. 1-162.

STEINBECK, J., and E. F. RICKETTS

1941. Sea of Cortez, a leisurely journal of travel and research. Pp. (x) 1-598. Viking Press, New York.

STEPHENSON, W., and JOY J. HUDSON

1957. The Australian Portunids (Crustacea; Portunidae). I. The genus *Thalamita*. Australian Journal of Marine and Freshwater Research, vol. 8, no. 3, pp. 312-368.

STIMPSON, W.

1858a. Prodomus descriptionis animalium evertibratorum quae in Expeditione ad Oceanum Pacificum Septentrionalem, a Republica Federata missa, Cadwaladaro Ringgold et Johanne Rodgers ducibus, observavit et descripsit. Pars. IV. Crustacea Cancroidea et Corystoidea. Proceedings of the Academy of Natural Sciences of Philadelphia, vol. 10, pp. 31-40.

1858b. [Same Title.] Pars. V. Crustacea Ocyphoidea. Proceedings of the Academy of Natural Sciences of Philadelphia, vol. 10, pp. 93-110.

1859. [*Haplocarcinus marsupialis*, a remarkable new form of brachyurous crustacean on the coral reefs at Hawaii.] Proceedings of the Boston Society of Natural History, vol. 6, pp. 412-413.

1860a. Sketch of a revision of the genera of Mithracidae. American Journal of Science, ser. 2, vol. 29, pp. 132-133.

1860b. Notes on North American Crustacea, in the Museum of the Smithsonian Institution, No. 2. Annals of the Lyceum of Natural History of New York, vol. 7, pp. 176-246.

1871. Notes on North American Crustacea, in the Museum of the Smithsonian Institution, No. 3. *Annals of the Lyceum of Natural History of New York*, vol. 10, pp. 92-136.
1907. Report on the Crustacea (Brachyura and Anomura) collected by the North Pacific Exploring Expedition, 1853-1856. *Smithsonian Miscellaneous Collections*, vol. 49, pp. 1-240.

TESCH, J. J.

1918. The Decapoda Brachyura of the Siboga Expedition, Hymenosomidae, Retroplumidae, Ocypodidae, Grapsidae, and Gecarcinidae. *Siboga Expedition Monograph*, vol. 39c, pp. 1-148.

WARD, M.

1934. Notes on a collection of crabs from Christmas Island, Indian Ocean. *Bulletin of the Raffles Museum, Singapore*, no. 9, pp. 5-28.

WHITE, A.

- 1847a. Descriptions of a new genus and five new species of Crustacea. *In*: Jukes, Narrative of the surveying voyage of H.M.S. Fly, commanded by Captain F. P. Blackwood, R.N., in Torres Strait, New Guinea, and other Islands of the Eastern Archipelago, during the years 1842-1846. Vol. 2, Append. no. 8, pp. 335-338.
- 1847b. List of the specimens of Crustacea in the collections of the British Museum. Pp. (viii) 1-143. London.

